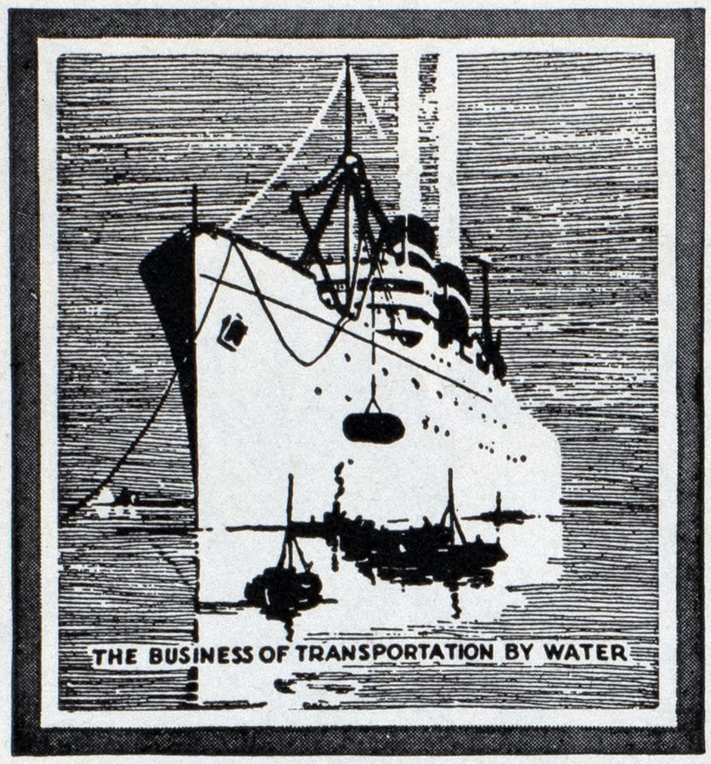
Marine Review

The National Publication Covering the Business of Transportation by Water

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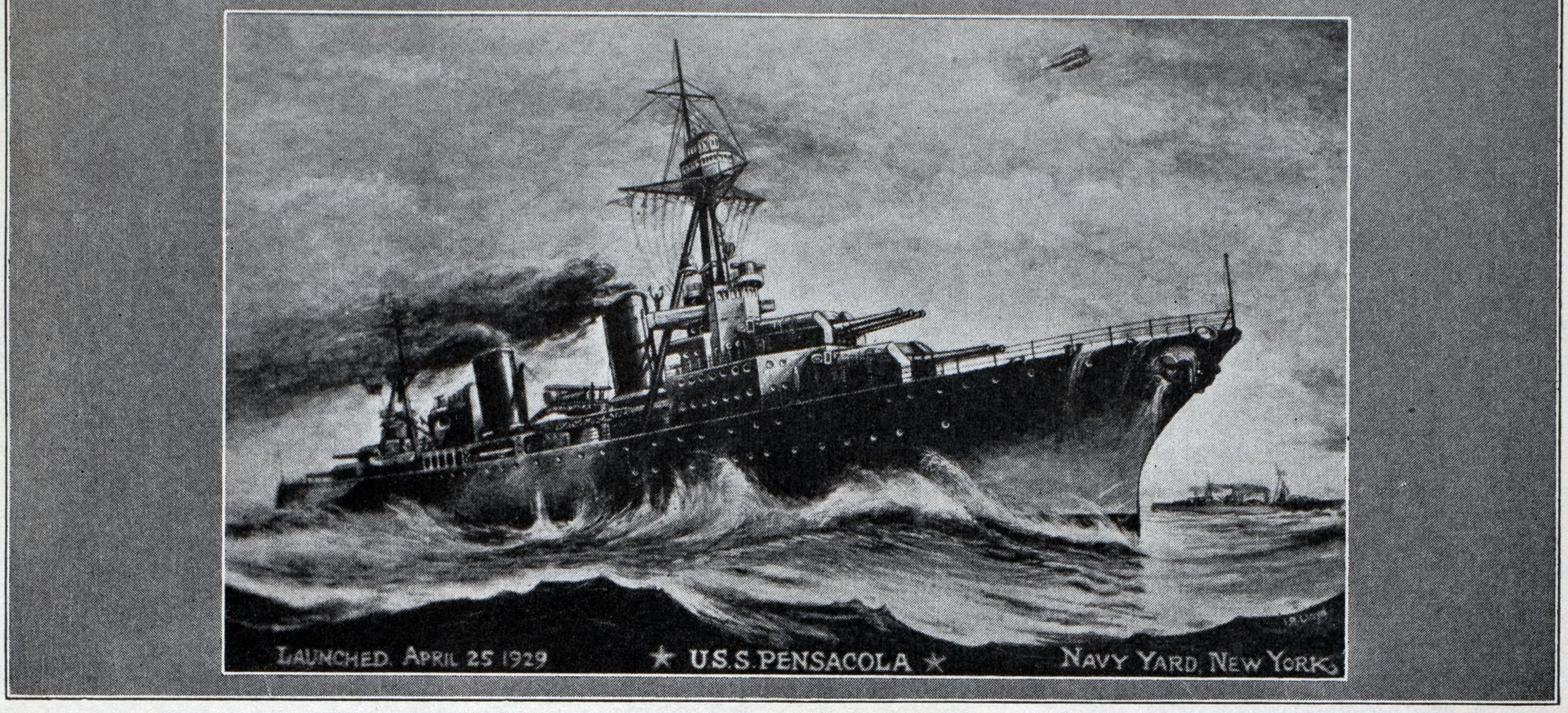
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Marine Review June 1929



U. S. S. Pensacola, from Artist's Drawing—Launched at the Navy Yard, New York, April 25, 1929

Speed Up Building of New Ships for Transatlantic Service

Editorial

THE United States is now represented in the transatlantic passenger service by one privately owned line flying the American flag. Every influence, private or governmental, should be brought to bear to make this venture successful. The failure of the new line under private ownership would be fatal to the progress under way to build up an adequate American merchant marine in overseas trade. Competition is now so thoroughly recognized as the leaven of trade that no ill will, to the extent of unfavorable action, is expected from the old established foreign transatlantic lines. At the recent annual meeting of the directors of the White Star line the chairman of the board, Lord Kylsant, expressed his opinion on the transfer of the United States lines to private ownership in the following words:

"We have followed with great interest the transfer by the United States shipping board of its passenger steamers to the United States line's private ownership. I personally welcome this step because I have always held the view that in the interests of all concerned it is better that vessels be run by private ownership. As chairman of the White Star line I look forward to co-operating harmoniously with the new owners of the United States lines." There is no reason to think that the respective heads of the Cunard, French, German, Italian and Dutch companies will not feel exactly the same about the transfer of the United States lines and will as cordially welcome the new owners into that most competitive of ocean services.

Hence it may be said that the United States lines, thanks to the years of continuous operation by the shipping board, has been accepted as a respected equal into this most powerful shipping group. Its ultimate chances for success will, therefore, depend upon factors over which the new managers of the line themselves have control. These factors as we see them are: To offer the traveling public the very finest service in which is particularly included special excellence of food and cleanliness of quarters. To conduct the business with so much zeal and attention to detail that the expenses of operation may be reduced to an absolute minimum. To plan with peculiar aptitude the rounding out of the line by the addition of high class, fast and beautifully ap-

pointed new vessels and to accomplish this in the shortest time possible.

So much has been said about the disadvantages of operating under the American flag that we propose to ignore these for the moment and to go on to some of the advantages. In the case of the United States lines the first and obvious advantage is the low initial cost of the ships of the fleet. This is based on the replacement cost of these vessels even in a foreign shipyard. Low capital cost is therefore one definite advantage possessed by the American owners. Under the Jones-White law, or by some direct arrangement with the post office department, a substantial mail subvention is paid annually to this line. Also 75 per cent of the cost of the proposed new vessels will be loaned to the line by the government at between three and four per cent interest. This low rate of interest will help to some extent to offset the 50 to 60 per cent anticipated greater cost of building ships in the United States.

We have saved to the last what we think is the greatest advantage of all and that is that the ships are flying the American flag and the owners are citizens of the United States. We have had to pass laws and to establish quotas for the entry of aliens into the United States in order to keep from being literally over run by nationals of all the countries of the world. So there must be some advantage even in shipping to be operating as Americans with the resources and great prosperity of the country to draw upon.

Business in the Atlantic trade, however, is intensively competitive. Statistics show that passenger travel has not nearly reached the high peak established before the war. Obviously the policy of restricting emigration into the United States is responsible for this reduction. It is said that there is no increase in the number of first class passengers. The tourists class and tourists third class showed an appreciable increase during the past year but the point we are making is that the transatlantic trade seems to be at the present time more or less static and there is some question, with new ships about to enter the service and others under construction, that there is an over capacity for the normal volume of business. Under these circumstances the line or lines that get the business will be those who give the best service and let the public know about it.

How to Build up Passenger Trade

It has been suggested by an experienced steamship man that it would be a good thing for the various transatlantic companies to get together to do effective cooperative world-wide advertising with the view of letting everyone know the advantages of travel and, to build up the acceptance of the idea to travel. Association publicity in other lines has been remarkably successful in creating a demand for what the members of the association sold. Cannot this be done for travel as well?

The present is a period of activity in world shipbuilding and particularly in the class of liners. The French line has its modern ILE DE FRANCE, the Italian line has its new diesel liners AUGUSTUS, SATURNIA and VULCANIA, the Swedish-American line the diesel liners GRIPSHOLM and KUNGSHOLM; the Holland-American line has the new STATENDAM; the White Star line recently laid down, what is reputed to be the largest liner in the world, the OCEANIC; the Hamburg-American line has a number of new smaller diesel liners; and last but not least the North German Lloyd is bringing out two high speed, large and luxurious liners, the EUROPA and BREMEN, the latter of which will begin her maiden voyage in July.

To meet this competition the United States lines must build fast vessels of large size with appointments representing the best in good taste and luxury. Time is an important element. It is necessary that no time be lost due to red. tape in having plans approved by this and that agency of the government. It is all important that the new vessels for the United States lines be ready for operation as soon as they can be thoroughly planned and properly built. Six months delay in placing the new ships in operation may mean the difference between failure and success of the entire enterprise.

The shipping board is to be commended for the apparent directness with which it has moved in the transactions leading to the sale of the government's transatlantic fleet. We hope that the shipping board will continue to show the same directness in dealing with the private owners of this fleet concerning the government's interest in the new ships to be built. It is natural and proper that the government should be satisfied as to the effectiveness and usefulness of these ships, both in times of peace and of war, since it is to sponsor so large a share of the cost. But with all due safeguards in this respect, weeks and months can be saved by working efficiently and using good sense.

Leviathan's Rust Resisting Steel

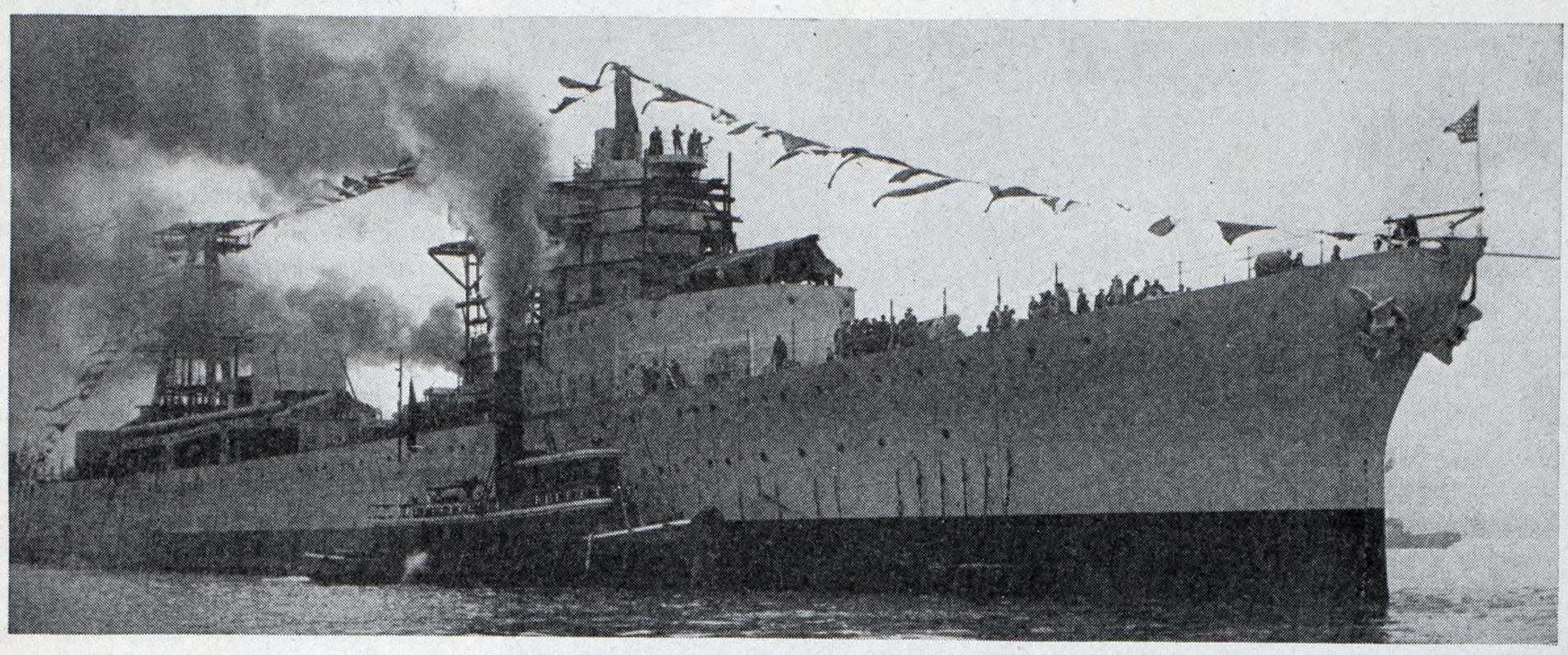
WHEN the LEVIATHAN was drydocked at Boston in May, 1923, for the first time since she was drydocked at Liverpool early in 1918, it was noticed that her hull plating was in a particularly fine state of preservation. On the other hand a piece of English steel which had been riveted to the stem of the LEVIATHAN when she was in drydock in Liverpool, five years before, was in a bad state of corrosion.

These incidents were brought to the attention of Dr. G. B. Waterhouse, professor of metallurgy at the Massachusetts Institute of Technology, by the editors of MARINE REVIEW. Through the initiative of the latter samples of the German steel and English steel of the LEVIATHAN were obtained through the courtesy of the commandant of the Charlestown navy yard. These samples were turned over to Doctor Waterhouse and in due course, nearly a year later, he prepared an article based on a careful metallurgical study of the characteristics of these samples of steel, which was published in the August, 1924 issue of MARINE REVIEW.

A great deal of interesting discussion and much study resulted from the investigation started by MARINE REVIEW and the article by Doctor Waterhouse. The latest is the publication in the bureau of standards *Journal of Research Vol. II*, February, 1929, of the results of laboratory corrosion tests with special reference to ship plate. This research is based principally on an investigation to determine if possible the superiority of the LEVIATHAN'S steel as indicated in the work of Doctor Waterhouse, above referred to. This document dwells on the importance which has been attached to the reports of the outstanding superior quality of the LEVIATHAN'S ship plate with respect to corrosion resistance, pointing out that within the past two years a large American oil refining company specified that in the construction of a tanker which was being built in a foreign shipyard, ship plate similar to that used for the hull of the LEVIATHAN should be used.

One of the possible reasons for the superiority of the LEVIATHAN'S steel advanced by Doctor Waterhouse's research was the presence of a comparatively high per-

(*Continued on Page* 34)



The U. S. S. Pensacola Shortly After Launching at the Navy Yard, Brooklyn, N. Y., April 25

Pensacola Launching Gives Data

Wide Distribution of Heavy Pivoting Load—Rocking Type of Fore Poppet Used—Care in Greasing Ways to Reduce Resistance

By H. C. Fletcher

Chief Draftsman, Brooklyn Navy Yard

THE scout cruiser PENSACOLA which was launched at the navy yard, Brooklyn, N. Y., on April 25, is the second of the 10,000-ton treaty cruisers to take the water. The sister vessel, the SALT LAKE CITY, was launched at the works of the New York Shipbuilding Co., Camden, N. J., on Jan. 23.

Honors of the occasion were performed by Mrs. Josephine Knowles Seligman of Roslyn, N. Y., and Pensacola, Fla., in the presence of Hon. Charles Francis Adams, secretary of the navy, and Hon. James J. Davis, secretary of labor and a large attendance of officials and naval experts.

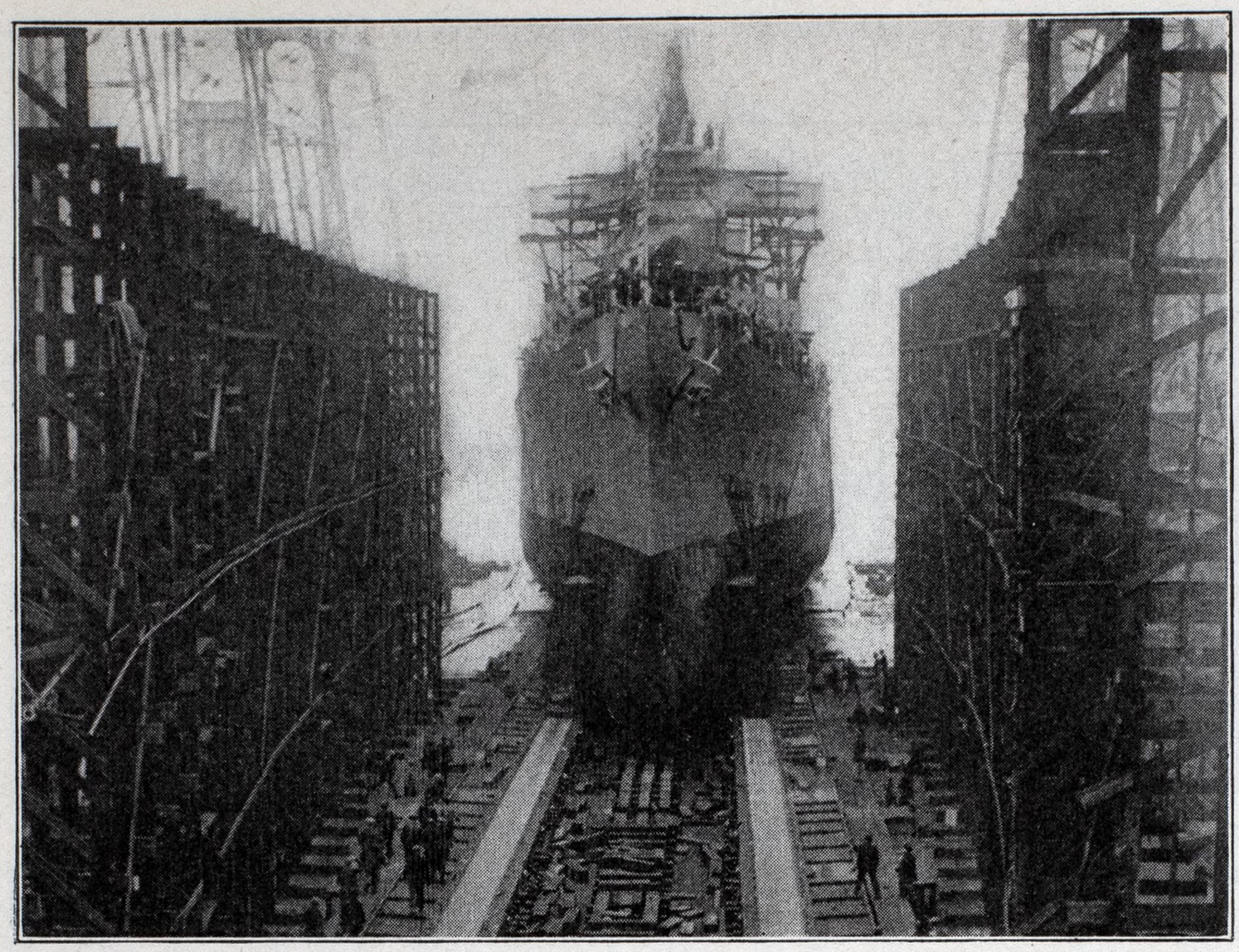
The keel of the PENSACOLA was laid on navy day, Oct. 27, 1926, and the first rivet was driven by William Green, president of the American Federation of Labor. Particulars of the vessel, hull characteristics, speed and launching data are given in detail on page 31.

Much interest attaches to the method of launching the PENSACOLA as a number of difficulties had to be overcome. In the construction of the fore poppet, prime consideration was given to insuring as wide a distribution as possible of the heavy pivoting load when the stern began to float, which occurred after the ship had run about 470 feet. A fore poppet of the trunnion or rocking type was adopted, which distributed the load over a way length of about 24 feet on each side.

On account of the fineness of the vessel forward, it was necessary to support the vessel on the fore poppet with saddle plates or belly bands.



AT LAUNCHING OF THE U.S.S. PENSACOLA—MRS. JOSEPHINE KNOWLES SELIGMAN, HOLDING BOTTLE—CHARLES FRANCIS ADAMS, SECRETARY OF THE NAVY—ADMIRAL L. R. DE STEIGUER, COMMANDANT OF THE BROOKLYN NAVY YARD



U.S.S. PENSACOLA—NOTE BULBOUS BOW FOR LOW RESISTANCE, GREATER SPEED

These saddle plates were not fastened to the ship, but passed around underneath the bottom with brackets at each end resting upon the fore poppet packing. The large space between the saddle plates and the hull was filled with concrete.

Because of this fineness of form, the main cradle packing could not be carried forward to the fore poppet, but was stopped about 34 feet aft and the intervening length of the vessel was carried on saddle plates similarly to those of the fore poppet. The brackets on the ends of these saddle plates were supported upon vertical timbers. The main cradle was constructed in the usual manner with fore and aft, and athwartship packing.

The after poppet consisted of vertical timber struts braced against the hull and located on frames. They were tied together athwartship by spreaders and wire rope frapping.

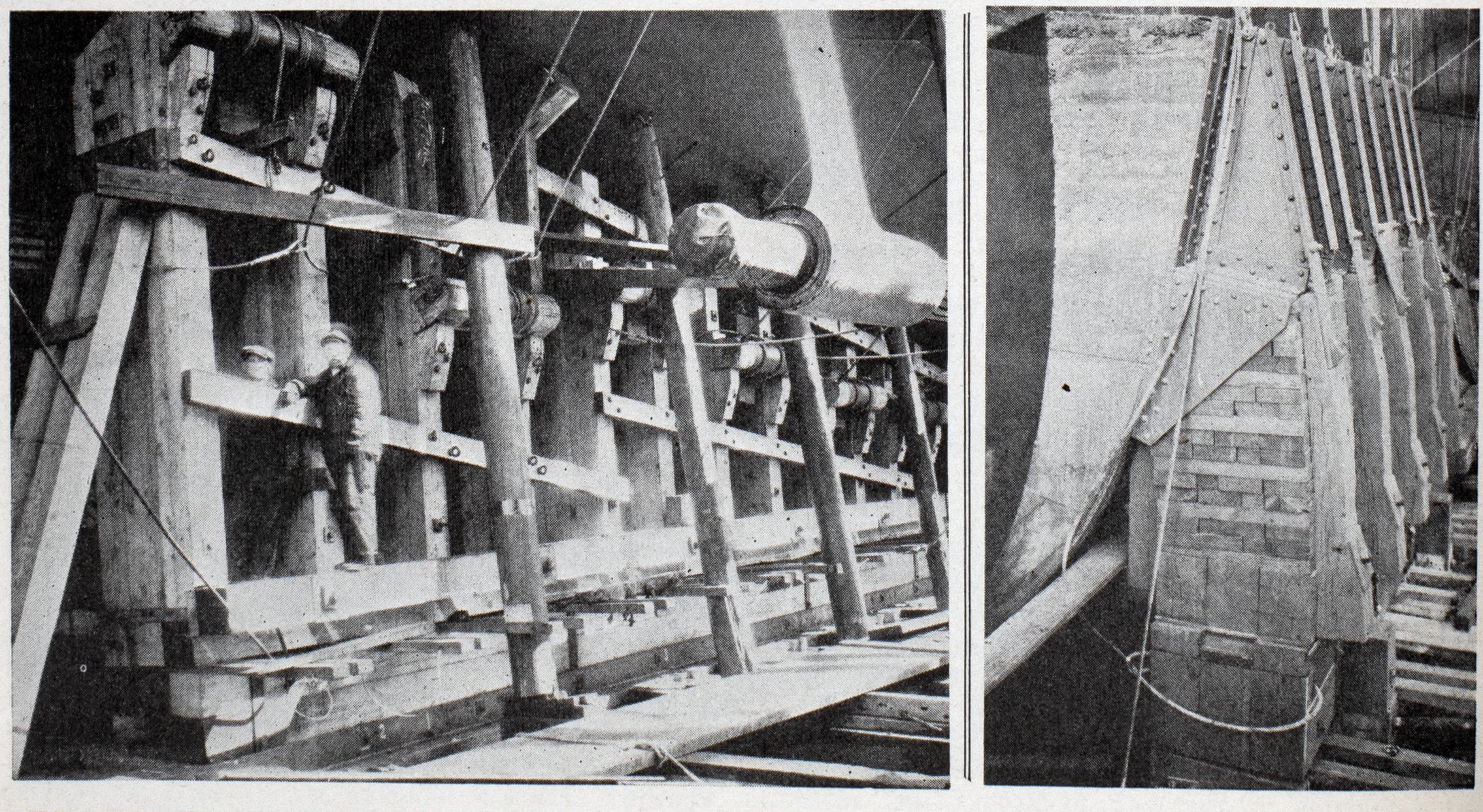
The ground ways were of heavy permanent construction and were built for the battleship SOUTH DAKOTA. Because of the great weight of the SOUTH DAKOTA, the initial launching declivity under the center of gravity was made only one-half-inch per foot. The ways were cambered to 24 inches in 680 feet.

On account of the small initial slope, there was some doubt as to whether a much lighter vessel like the PENSACOLA would start and could attain a speed that would build up sufficient momentum to overcome the water resistance and carry through, especially since it was not possible to grease the underwater portion of the ways. The allowable way pressures and lubrication presented a problem.

Determine Initial Way Pressure

An initial way pressure of 2½ tons per square foot was considered necessary to insure starting, which figure established 38½ inches as the width of the sliding ways. With this pressure and width of ways, it was necessary to obtain a base lubricant and a launching grease of sufficient hardness to carry this pressure and the heavy pivoting loads and not squeeze out or wipe off. After numerous experiments and tests made at the yard, Paragon launching stearine was used as the base coat and Keystone No. 600 launching grease for the slip coat. The base coat was applied ½-inch thick throughout and the launching grease ¼-inch thick for the length of the sliding ways and ⅛-inch thick from the sliding ways to low water.

The base coat was flowed on to



U.S.S. PENSACOLA. LEFT—AFTER POPPET, STARBOARD LOOKING FORWARD. RIGHT—FORE POPPET, PORT LOOKING AFT

the ground ways hot and leveled off with battens to the proper thickness. To insure adhesion to the portion of the ways between high and low water, the ways, at low tide, were dried by burning shavings and sawdust saturated with kerosene spread over the surface and by hot plates. The ways were then roughened and scored athwartship and the stearine was then flowed on. Two brush coats of hot stearine were applied to the underside of the sliding ways.

Lubrication of Ways Important

As the lubricating qualities of launching stearine under static conditions are not very high, in order to eliminate lumps and high spots that might penetrate the slip coat under pressure and come into contact with the sliding ways and thereby increase the coefficient of starting friction, the surface of the base coat in way of the sliding ways was faired and finished smooth with hot ironing plates.

The vessel showed early and decided tendencies to creep as the supports were being removed and, when released, picked up speed at a rapid rate. The speed, which was recorded by a chronograph and also by observations from marks on the side of the vessel, showed a maximum of 21.6 feet per second and 16 feet per second as she floated off the end of the ways. There was no indication of smoking or excessive friction and from a careful inspection of the ways after the launching the base coat was found to be intact with very little reduction in thickness.

The vessel was held against starting at the head of the ways by two steel sole plates ¾-inch thick which were cut by acetylene burning torches. A large section of the plates broke away before the burning was completed and from which the actual starting force was determined.

Particulars Pensacola

Length over all ft., ins.	585-6
Length on design water line, ft., ins.	570-0
Breadth extreme, ft., ins.	65-3
Depth, molded at side, to main deck amidships, ft., ins.	34-0¼
Depth, molded at centre, to main deck amidships, ft., ins.	35-0
Displacement, standard, tons	10,000
Draft or design waterline, ft., ins.	19-6½
Speed, knots	32½
Percentage of completion:	
Hull approx., per cent	73.7
Machinery approx., per cent	62
Weight of ship at launch, tons	6,794
Weight of cradle, tons	356
Total launching weight, tons	7,150
Draft forward, ft., ins.	10-1
Draft aft, ft., ins.	15-9
Maximum draft aft before pivoting, ft., ins	26-4
Maximum speed—feet per second	21.6
Speed when ship left the ways—feet per second	16.0
Height of tide over way ends, ft., ins.	12–0
Length of sliding ways, ft., ins.	457-0
Width of sliding ways, effective, ins.	38½
Spaced, between centers, ft., ins.	26-0
Declivity—½ inch per foot under centre of gravity, initial; max. 11/16 inch per foot at way ends, 24 inches camber in 680 feet.	
Theoretical component down ways, tons	298.15
Actual starting force, tons	200.16
Coefficient of starting friction	0.014
Pressure per sq. ft., initial, tons	2.44
Total pivoting load, tons	1900
Pivoting pressure per sq. ft., tons	12.3
Maximum way end pressure per sq. ft., tons	3.88
Total run of ship before leaving ways, feet	680
Drop off end of ways, ins.	6

Completes Difficult Tow

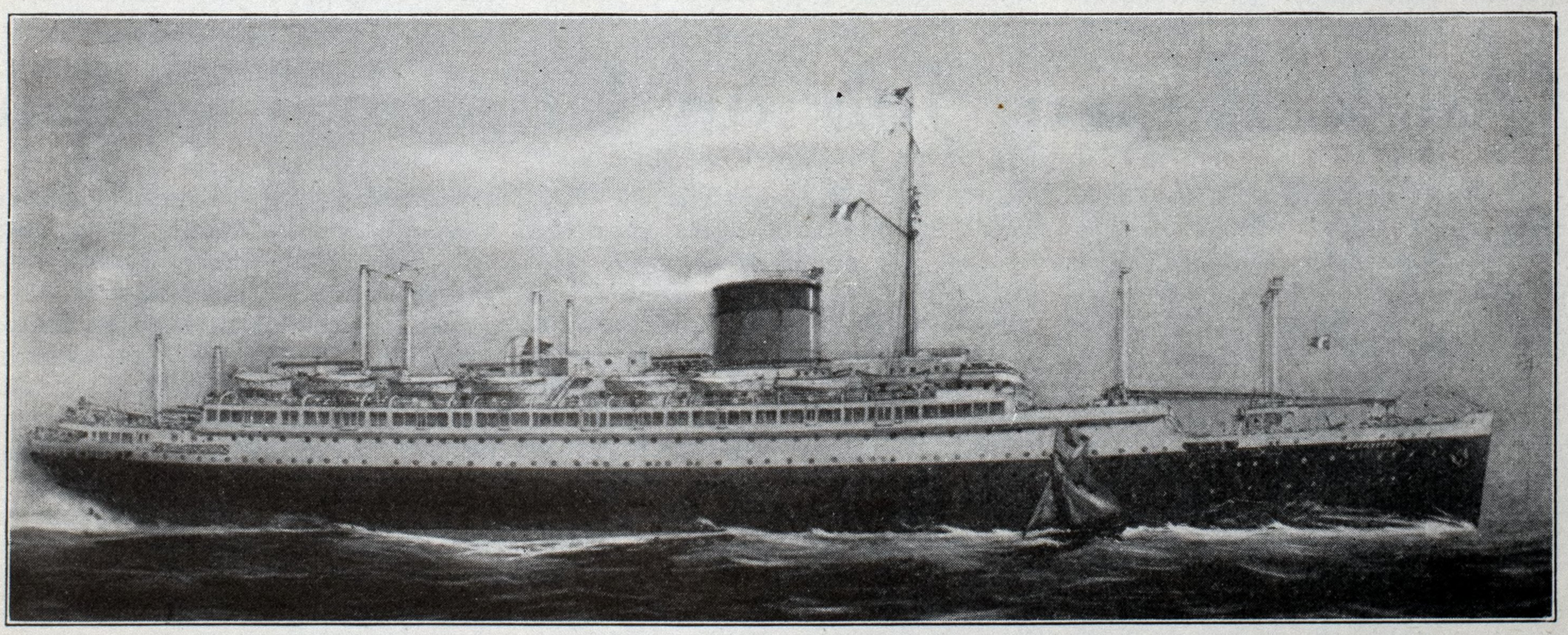
The ocean-going tug SALVAGE KING recently returned to Vancouver after towing the disabled freighter HAVILAH from Dutch Harbor, Alaska, to Osaka, Japan, a distance of 3,100 miles. It took 25 days to take the HAVILAH through the Aleutians and across the Pacific to Osaka, and when the SALVAGE boat returned to Victoria she had covered 10,000 miles in 60 days, battled 16 separate gales, and performed a feat that many practical seamen declared was impossible. The HAVILAH, with 4,000,000 feet of lumber aboard, was an unwieldy tow, her steering gear being out of commission. At one time shifting of the lumber cargo threatened to sink the freighter, but the crew, working under the handicap of high wind, heavy sea and a blinding snowstorm, managed to make the lumber fast.

Lafayette, New Diesel Liner Launched

THE new 21,500-ton diesel liner LAFAYETTE, building for the French line, was launched May 9, at the Penhoet shipyards at St. Nazaire. When completed, early next year, this new diesel-driven ship, will take her place in the New York-Havre service as the flagship of the line's one class cabin fleet. This service is now maintained by the DE GRASSE and the ROCHAMBEAU.

The launching took place in the presence of a large and distinguished assemblage, including many prominent guests from Paris. The guests were entertained at luncheon aboard the liner ESPAGNE, following which the LAFAYETTE was released from her cradle and sent sliding gracefully into the waters of the port.

Among the salient features of the LAFAYETTE'S construction are: Gross tonnage, 21,500; displacement, 25,550 tons; length, 600 feet; width, 84 feet,



ARTIST'S DRAWING OF NEW CABIN LINER LAFAYETTE LAUNCHED AT ST. NAZAIRE MAY 9—FITTED WITH FOUR DIESEL ENGINES

providing spacious decks and commodious cabins. Her draft will be 30 feet, 6 inches, and depth to "B" deck, 50 feet. There will be one wide, short funnel and only one single mast, forward of the funnel, giving to the vessel the swift, modern silhouette of the popular new motorships.

All of the most modern safety devices will be installed on the new ship. The vessel is being constructed in conformity with the highest standards of the Bureau Veritas and in compliance with the stipulations of the last international convention for the safeguard of life at sea. The hull will be divided into eleven watertight compartments, equipped with automatically closing watertight doors on each deck. These can all be operated simultaneously from the bridge, or, individually, by hand. An electric indicator on the bridge shows the exact position of each, whether open or closed. A cellular double bottom will extend the full length of the ship, divided longitudinally and transversely, into various watertight tanks.

The steering gear is of the modern Hele-Shaw type. In case of emergency, the rudder can be operated by either of two emergency steering systems.

Fire fighting apparatus of improved type will be installed aboard the new motorship. Two 150-ton capacity electric pumps, always under pressure, will furnish the power for the hose, and along both sides of the ship, at intervals of 30 to 40 feet, will be hose connections, allowing every corner of the ship to be reached by powerful streams of water.

Life boats, with a capacity greater than the requirements, will have Welin-Maclachlan type davits, similar to those on the ILE DE FRANCE, thereby insuring a rapid and safe means of launching them. They will be operated electrically, by the central power plant while it is in service, or by a reserve plant in case of damage to the central plant. The liner will also be equipped with two 50-foot motor boats, capable of towing all the life boats. These motor boats carry powerful wireless equipment.

The wireless equipment consists of two high powered posts, one to be used as an emergency unit. They will have a radius of 1000 to 1500 miles by day, and 2000 to 3000 by night. In addition, there will be a smaller set, using electric batteries for use in extreme emergencies. Additional equipment includes a radio telephone station, a simultaneous sending and receiving station, a news-receiving station and a short wave station. In addition, the vessel will have among its navigation instruments; radio compass; gyro compass; gyro pilot; Florisson Langevin continuous depth sounder; Marti recorder; automatic draft indicator; and a powerful Sperry searchlight.

The LAFAYETTE will be driven by four powerful M.A.N. motors of the double acting two-stroke type, each motor having six cylinders. The four engines develop together, 20,000 horsepower.

The auxiliary machinery is composed of five single acting four-stroke M.A.N. motors, operating the pumps (33 in number), and the central electric plant. This central electric plant supplies the current for operating the windlass, the capstans, steering gear, ventilators, refrigerating machinery and kitchen equipment, and for cooking, lighting and heating. In addition to this central plant, there will be an emergency electric plant, run by an independent motor, placed on the bridge deck, which would insure, in case of accident, the normal operating of the lighting system, the lifeboat winches, the wireless station and all navigating instruments.

There will be nine complete decks, the 'tween decks height of which will be 7 feet 6 inches in the lower 'tween decks and on the bridge, and 8 feet 10 inches in the dining room deck. There will be five holds, three forward and two aft. The 'tween decks of holds 1 and 2 will be equipped as a "floating garage" for the transportation of uncrated automobiles. Hold No. 4 will contain the refrigerating apparatus and a compartment for the mails. The refrigerating apparatus will be of the very latest type, and the refrigerated space of unusually great capacity. This will be divided into various compartments, each of which can be kept at a different temperature, thereby allowing the carrying of a large and varied assortment of refrigerated cargo. A special device allows the temperature of each compartment to be controlled from the engine room, thus insuring a perfect maintenance of the desired temperature, from 5 degrees above zero (centigrade) to 10 degrees below zero (centigrade).

The LAFAYETTE will carry 591 cabin passengers, 334 tourists and 142 third class.

The promenade deck is entirely glass enclosed, providing complete shelter from inclement weather, and at the same time permitting full enjoyment of fair weather. A 3-foot overhang on each side gives it that much added width. A high degree of luxurious comfort will be attained in the passenger accommodations, and the decorations will be the work of noted French artists in this important field.

The complement of the vessel will consist of 32 officers and 428 men. The launching of the LAFAYETTE, the sixth addition to the French line fleet to be launched within the past year, marks one more step in the rapid progress of the French line.

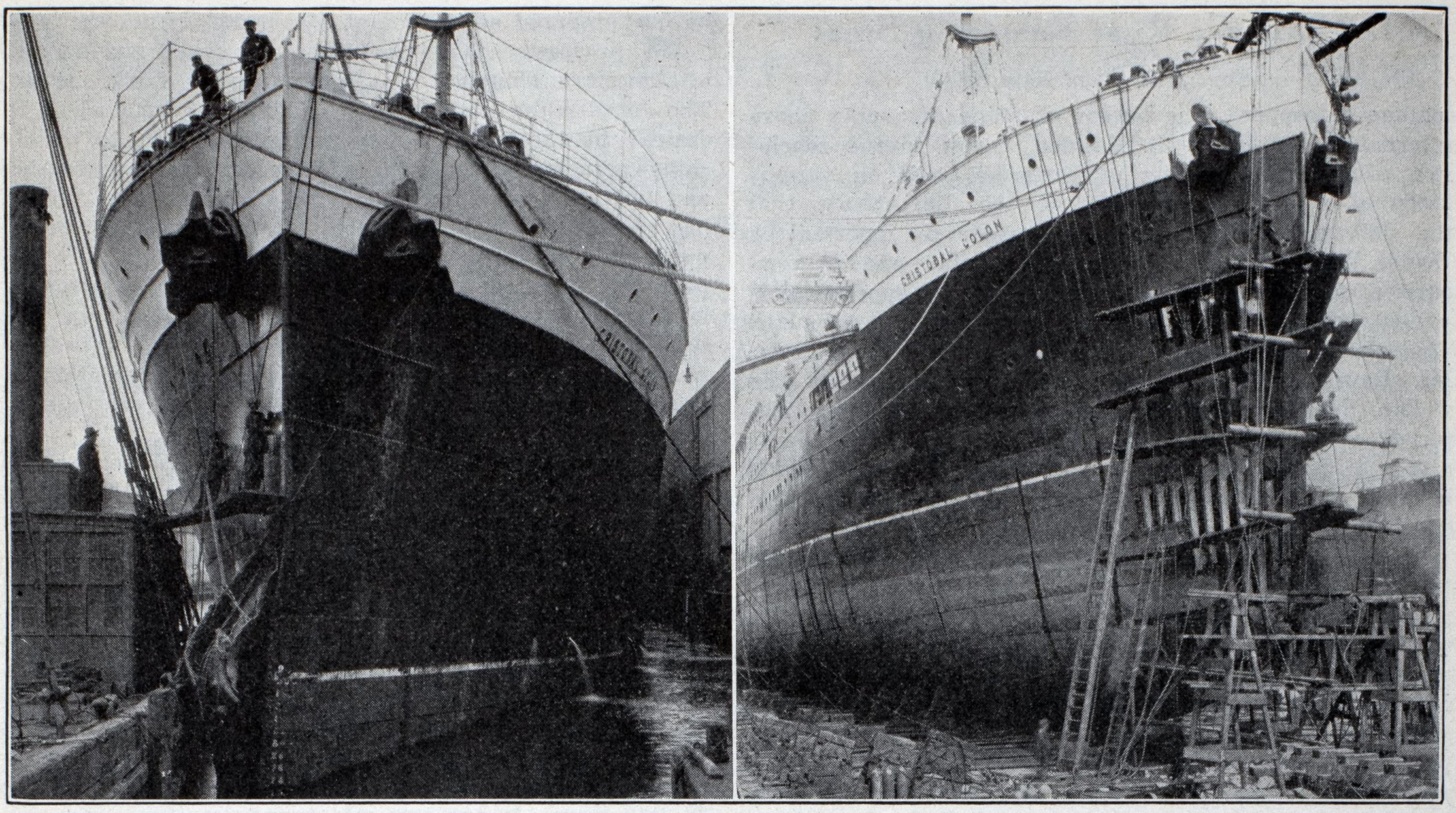
Quick Repair Job on Cristobal Colon

A REMARKABLE piece of repair work which demonstrated the efficiency of a modern repair yard was performed recently at the Morse plant of United Dry Docks, Inc., New York, when workmen labored day and night to restore the badly damaged bow of the Spanish liner CRISTOBAL COLON. The vessel had been in collision on May 2 off Quarantine New York harbor with the steamer RIVER ORONTES.

An unusual feature of the incident was the fact that throughout the four days the CRISTOBAL COLON was in dry dock more than one thousand of her passengers remained aboard. By arrangements made with the Morse plant all the sanitary and other equipment of the steamer was maintained in normal operation and the passengers suffered no inconvenience.

When tug boats were able to pull apart the tightly locked ships the CRISTOBAL COLON was towed to her own pier on the East river and officials of the United Dry Docks Inc. were called into consultation. The two main problems presented concerned the excessive draft of the vessel, which was fully loaded, and the necessity of caring for the passengers aboard. Investigation disclosed that the big dock at the Morse plant was the only one available in the port able to handle the task, and on the afternoon of May 3 the contract for repairs was awarded United Dry Docks, Inc.

Workmen from the Morse plant at once began the removal of damaged plating while the ship was at her own pier. Before one o'clock of the next day, when the vessel was moved



SPANISH LINER CRISTOBAL COLON AFTER COLLISION WITH FREIGHTER S. S. RIVER ORONTES, NEW YORK HARBOR, MAY 2. LEFT AT PIER 8, EAST RIVER, REMOVING DAMAGED PLATING. RIGHT—IN DRY DOCK AT MORSE PLANT, UNITED DRY DOCKS

into dry dock, all of the plates above the water line had been removed. Before sunrise on Sunday, May 5, all the damaged plating, together with a twisted section of the stem and all internal damaged parts had been removed and the new construction was well under way. By the end of the day part of the new construction was in place, so that by Monday morning the entire hull plating on the port side of the stem had been fitted in position.

A new stem section was installed and fastened Monday and during the night and the following day all remaining new parts of the bow had been fabricated and put up, so that on May 7 all the plating except the closing plate was up and a great deal of it riveted. The final plate was put on during the night of May 7, and the remaining riveting completed. The balance of the work, including the caulking and testing, was completed on May 8 and the vessel was floated on the morning of the ninth, ready to sail that day.

The magnitude of the task can readily be appreciated when it is considered that the steel handled consisted of sixteen plates, port and starboard sides, together with several new bulb frames, forepeak tank top, and all internal breasthooks and connections to the shell.

The commander of the CRISTOBAL COLON, Capt. R. Fano, was so well satisfied with the expeditious handling of the work of repairing his badly damaged ship that he expressed his appreciation in a letter to J. Alberich, who represented the yard. The Captain particularly commended the manner in which the plant co-operated with the ship in maintaining its service to the large number of passengers who continued to live on board.

Merchant Marine Loses Staunch Supporter

In the death of Alexander R. Smith on May 13, American shipping loses a stalwart champion and students of this subject a fountain of maritime knowledge.

Beginning his sea life as a boy of 15, he shipped on a square rigger which took him to many world ports until he had circled the globe. He founded the *Seaboard*, a merchant marine publication, in his home city, New York, and continued active with such publications to the date of his death, at which time he was editor of the *Port of New York*.

From the first he was a student of shipping ranking with the late William W. Bates and Winthrop L. Marvin. A third of a century ago he became the trusted adviser of at least two presidents as well as of senators and representatives who were interested in restoring America's merchant marine. No national conventions of either party from 1884 to 1920 were without his active presence —his hand helped to write many of their shipping planks. Congressional hearings abundantly show not only his enthusiastic interest in this great problem, but reveal an exhaustless knowledge which questionings, hostile as well as friendly, only served to make more impressive. He knew and he fearlessly stood by his knowledge unswerved by any intimidating suggestions of expediency.

One of his more recent works of importance was a complete digest of all maritime legislation, proposed as well as enacted, appearing during the entire existence of the United States government.

While it is so often said that no man leaves a place that cannot be filled, it is doubtful if there is now anyone living with that complete knowledge of merchant marine problems, perfected by more than 50 years of uninterrupted study and experience, who can fully replace Alexander R. Smith.

The United States shipping board, with which Mr. Smith had been actively connected, adopted a resolution eulogizing him in recognition of his devotion to his duty and untiring efforts in support of American shipping.

The shipping board on May 16 directed the Merchant Fleet Corp. to offer for its consideration a form of lump sum operating contract looking to the allocation of the five steel cargo vessels of the American Merchant Lines cut port service to a managing operator located at Norfolk.

Leviathan's Rust Resisting Steel

(*Continued from Page* 28)

centage of copper. The bureau of standards paper above referred to, by Henry S. Rawdon, comes to the conclusion after noting results of corrosive tests on various kinds of steel including that of the LEVIATHAN that the difference in the corrosion resistance reported by Doctor Waterhouse for the LEVIATHAN plate and the comparison steel does not necessarily indicate superior corrosion resisting properties for the LEVIATHAN plate. The laboratory tests did not show any such superiority. Mr. Rawdon offers the alternative explanation of the widely different condition under which the two materials were used, that is, that the English steel was attached as a projecting element and therefore would be more subject to cavitation of water which would produce the effect of aeration on corrosion.

It would be interesting to pursue the subject still further. Severe corrosion of ship plates and particularly rivets has been definitely established, for instance, in tankers not over twelve years of age. It may be that the condition of the water in which these tankers operated had something to do with it; also very likely a marked difference in material between the rivets and the ship plate might set up an electrolytic action which would augment corrosion. However, it is a fact that the combination of rivets and steel in the hull of the LEVIATHAN has stood up almost perfectly. The striking difference between this result and the established severe corrosion referred to in the case of several tankers is significant. We don't believe that the answer is quite as simple as that propounded by Mr. Rawdon of the bureau of standards.

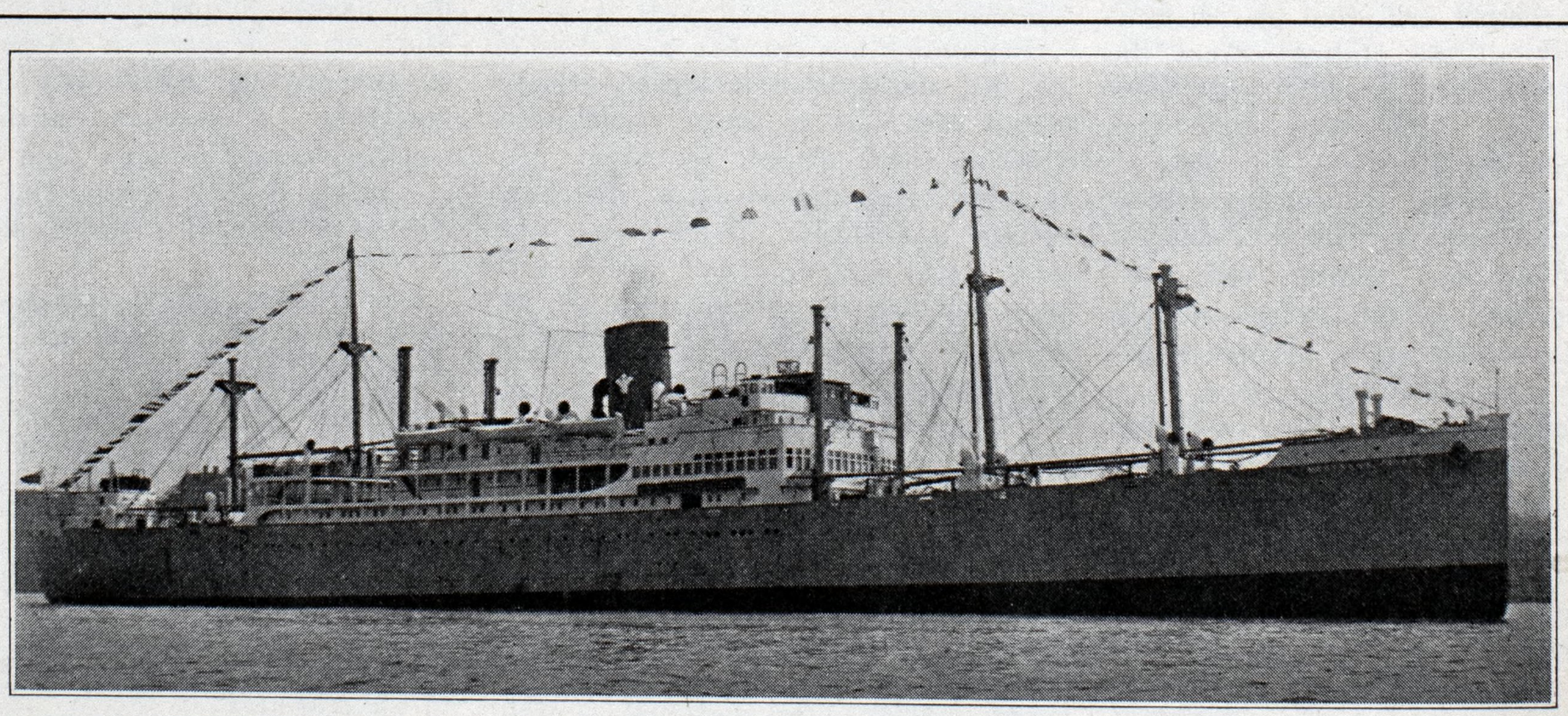
A Better Deal for American Ships

ELSEWHERE in this issue there appears a sketch of the career of Roger D. Lapham head of the American-Hawaiian Steamship Co., one of the leading lines in intercoastal trade. Mr. Lapham has given much thought to the question of what should be done to get the American flag back into overseas trade, and at our request he has prepared an outline of his views as follows:

The prospects of the American merchant marine and of American shipping in general, appear fairly bright. The Jones-White law, although leaving a good deal to be desired in the matter of governmental aids to enable shipowners to overcome the greater costs of construction and operation of ships under the American flag, was a big step in the right direction. It laid down a general policy and established a precedent, and under this impact the American merchant marine is being propelled into a decidely better position than any it has been able to occupy since the end of the World war. With reasonably fair chances of securing additional legislation of this salutary character, its position should continue to improve.

Supplementing the effect of the Jones-White law, is the manifest disposition of the shipping board to sheath the Damoclean sword that has been hanging over the head of the American shipowner. The recent sale by the board of the United States and American merchant lines to private American interests, is an earnest indication of the government's intention of getting out of the shipping business, following, as it does, in the wake of the board's sales, during the three year period ending June 30, 1928, of 255 vessels of 1,787,197 deadweight tons to private American owners. According to Chairman O'Connor (March, 1929), since 1924 the board has been operating 38 ship lines. It has now sold twenty of these lines and by the spring of 1930 will have sold at least another six. All remaining lines, he stated, will be sold as rapidly as private American capital is willing to take them over.

All this is good news, not only to the American shipowner and the shipping industry, but to the whole country. It remains now for congress to go ahead and complete the work it has started—to go the whole way in making up the differential between building and operating costs here and abroad, and to repeal or modify such legislation as hampers and unduly restricts the American shipowner. With these artificially imposed handicaps removed, it it reasonable to expect that the American merchant marine will assume and maintain that position on the sea to which, by virtue of the size and importance of our commerce, it is justly entitled.



M. S. Northern Prince—Sailed on Maiden Voyage New York to East Coast South America, May 11—Speed on Trial in Excess of 19 Knots—See Marine Review for April, Page 81, for Complete Description

Welding for Ship Construction

Saves Weight, Reduces Cost—Germans Revolutionize Naval Building—Study Stress Behavior—Procedure Control Eliminates Faulty Work

By E. C. Kreutzberg

GREAT progress has been made during the past three years in the application of welding to ship construction, according to James W. Owens, director of welding for the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., and winner of the $10,000 Lincoln prize for his international paper on arc welding, in a talk before the Philadelphia section of the American Welding society, May 20.

Chagrin was expressed in an emphatic manner by Mr. Owens, however, over the fact that Germany is far in advance of the United States in welding of naval ships. He went into some detail about the ERSATZ PREUSSEN, the new 9000-ton cruiser which has caused a furore in international naval circles. Although limited to a 9000-ton ship, Germany was able to achieve remarkable results as compared with the 10,000-ton cruisers of the other powers. By welding the cruiser throughout, by using alloy steels, and by installing an engine weighing 17½ pounds per horsepower, the German builders were able to cut the total weight of the vessel by 550 tons. As a result, the cruiser was equipped with 11-inch guns, whereas under the Washington treaty, limits we must equip a 10,000-ton cruiser with 8-inch guns.

Navy Should Take Lead

This German accomplishment has a distinct bearing on the future of naval and merchant ship construction. Welding of vessels throughout not only cuts their weight and gives them greater carrying capacity or greater speed, but it makes them safer and reduces the cost of upkeep. He mentioned one all-welded freighter which went aground. The hull was deformed by the collision but there was no leak and the cargo remained intact. He expressed the opinion that a similar mishap with a riveted ship would have caused at least the loss of some of the cargo.

Leadership in developing all-welded ship construction in this country should devolve upon our navy department, said Mr. Owens. He strongly advocated that congress authorize the navy to weld one of the 15 new cruisers; if not a cruiser, then a destroyer, a submarine or some other boat. An all-welded submarine, he said, would mean a greatly improved submarine. Saving of weight would permit more effective handling of these boats. Welded submarines would permit of designs that would give the crews more comfortable quarters, and they would be oil as well as watertight, and would not give off the oily streak that rises to the surface from a riveted submarine and gives the enemy a fine indication of where to drop depth bombs.

Private yards cannot expect to take the lead in the construction of all-welded vessels, said Mr. Owens. When a boat is constructed in a private yard, the personnel of the yard, the architects and engineers and the owners all are involved, and there are too many unknown factors at present to justify profitably all-welded construction for private yards. A considerable amount of experimentation is necessary. For instance, it is known in a general way that welding of the hull plates moves the sides in and raises the bow and stern, whereas precise, specific data are needed. Experimental and investigational work will be costly, and it is only fair to look to congress to make the necessary appropriations, because the results obtained from such studies by the navy department would be passed on and would be of assistance to all American shipbuilders and operators of boats under the American flag.

Mr. Owens showed several views of ships that have been welded in Germany. One of them was a 46-foot vessel which the Germans welded in order to gather their preliminary data on the effects of welding stresses. The photograph plainly showed how, during the longitudinal welding of the hull, the bow and stern rose from the keel-blocks. Other photographs showed German bulkheads which had been welded with a 47 per cent saving in weight.

That portion of Mr. Owens' remarks dealing with the progress in this country showed that welding already has won a permanent place in ship construction here, even though it has not yet gotten as far as the hull and strength joints. In fact, the progress already made has been very effective in reducing the weight of new ships. He showed photographs of a great many different welds in ship construction.

One particularly interesting job was the welding of a high pressure cylinder for an 11,000-ton vessel. This was a very complicated job. Valve ports in this cylinder had failed and to get at them from the interior, it was necessary to cut a hole in the cylinder. Mr. Owens said it was very much like a surgeon puncturing a human anatomy in order to get at the internal organs. This job was welded several years ago. This high pressure cylinder since has been in continuous operation with satisfaction.

Practical Welds Illustrated

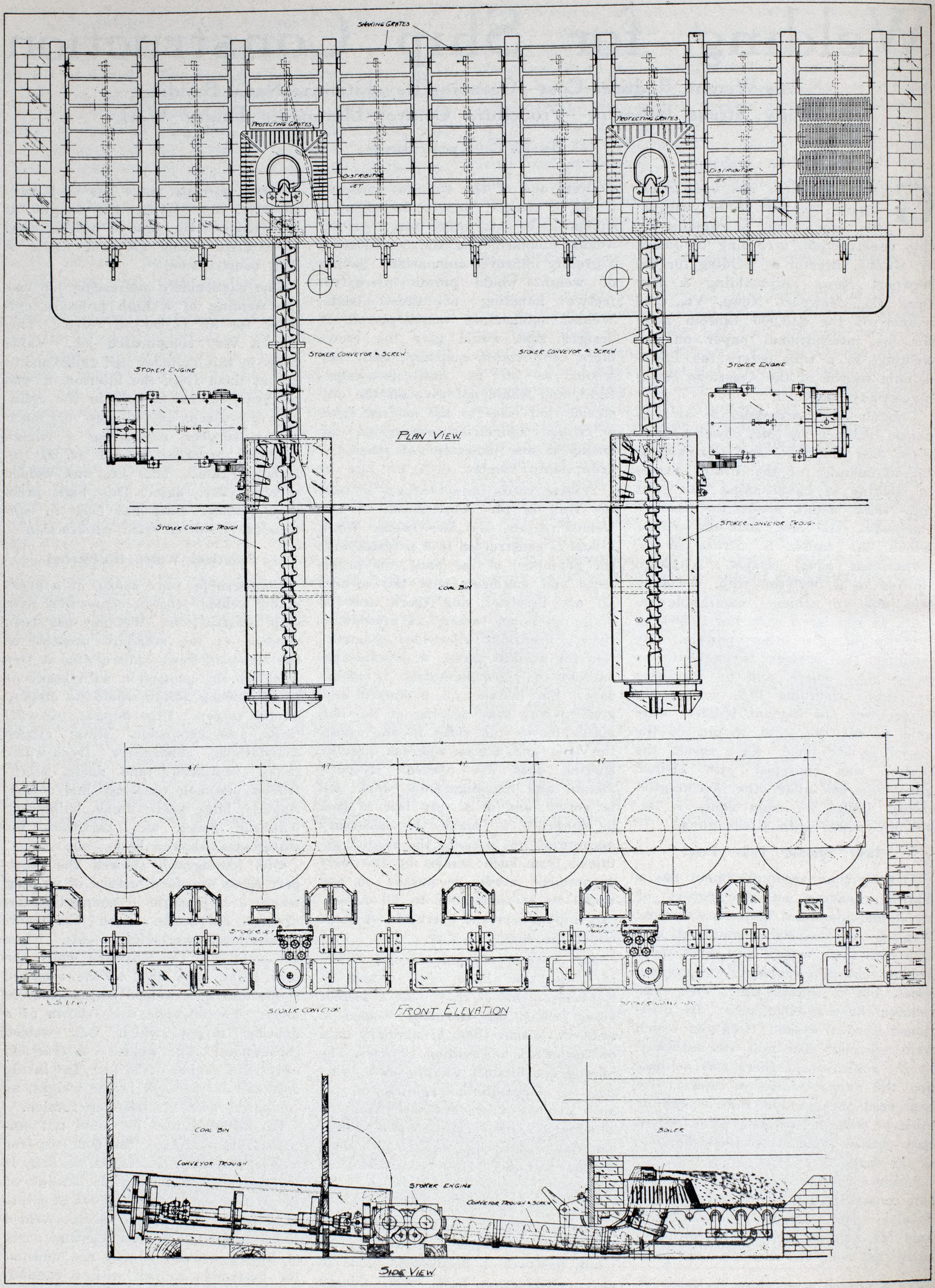
Photographs were shown of a great many welded jobs in connection with ship construction. Welding has been adopted as the standard practice at the Newport News Shipbuilding & Dry Dock Co. in connection with many of the following items which he showed on the screen: Pipe flanges, pipe fittings and expansion joints; engine foundations, condensers, fresh-water tanks, ventilators and ducts, sternframes, manhole coamings and covers, rudders, bilge keels, decks, bulkheads, bulkhead floors, etc., partitions for staterooms, shower baths, etc.

One photograph showed the Newport News standard method of welding where a ship angle or channel passes through bulkheads. Such jobs result in absolutely watertight welds. Pipes are welded to the bulkhead walls, the pipe being bent first to the required shape and then welded permanently in place. Photographs were shown of a floating target which was welded throughout. The welded construction, effected a saving of 25 per cent in the cost and 11 per cent in the weight, as compared with riveted construction.

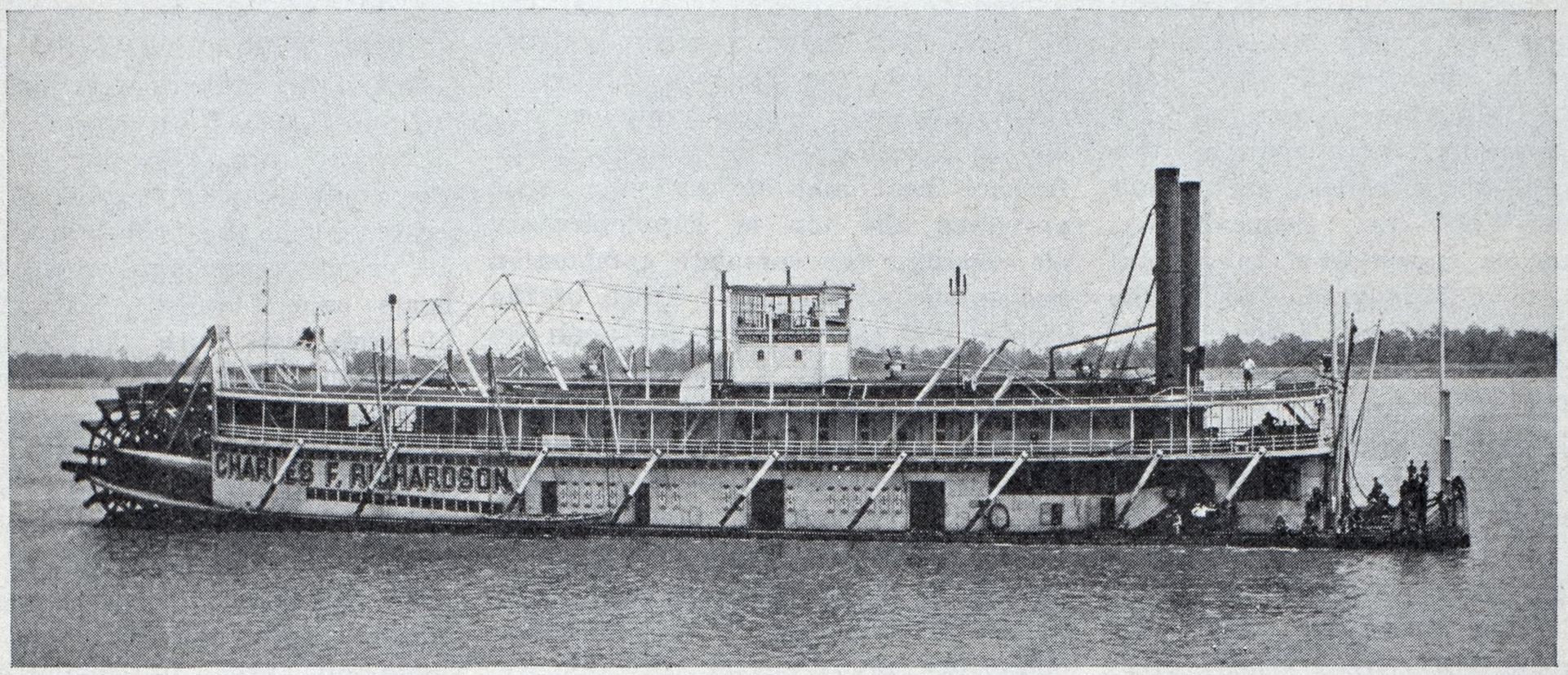
He declared that he could not emphasize too strongly the necessity for studying stress behavior in welding. It is necessary to have a knowledge of the stresses of different types of joints in order to be able to design welded joints properly. He recalled that early in his experience it was not unusual for buttwelds to fail with a cannon-like report hours after they had been

(*Continued on Page* 66)

This is a report of an address by James W. Owens, director of welding at the Newport News Shipbuilding & Dry Dock Co., before the Philadelphia section of the American Welding Society on May 20, 1929.



STEAMBOAT TYPE OF STOKER DEVELOPED BY THE STANDARD STOKER CO. INC. THIS DRAWING HAS BEEN REVISED TO OCT. 25, 1927. ORIGINAL STOKERS OF THIS DESIGN INSTALLED ON RIVER TOWBOAT, C. F. RICHARDSON, IN 1924, NOW IN USE



Charles F. Richardson—Powerful Mississippi River Towboat—Equipped with Mechanical Stokers for Firing Coal

Mechanical Firing Cuts Fuel Bill Uniform Pressure Maintained

By F. P. Roesch

THE inefficiency and the inconvenience of hand firing have had the direct effect of displacing coal as fuel, particularly in marine work, in spite of the fact that on the basis of heat units it is the cheapest fuel. There are many indications that this condition will not continue. Much work is being done in a practical experimental way to solve the problem of mechanical firing of coal on shipboard. These experiments are directed along two lines; the use of mechanical stokers and the use of pulverized coal. Many real problems have been met, particularly in the application to the scotch marine boiler with its limited combustion space.

Compared with locomotive applications for instance, there has been but little headway made in the marine field in substituting mechanical means of firing in place of manual labor; and this regardless of the fact that in many instances greater economies are obtainable than in general railroad practice. It is self-evident that had the same thought and study been applied to marine equipment as to locomotive and stationary power plants a mechanical stoker would have been developed long ago that would meet the more exacting requirements of marine service.

These requirements briefly are, a machine that will handle any grade of coal, that requires no skilled labor in its operation, that will insure full steam pressure under practically all operating conditions, that is as sturdy and reliable as any other part of the power plant, that will not take up valuable cargo space, that will not interfere with hand firing if necessary or desirable, and one that can be adjusted to supply and distribute the coal regularly, evenly and lightly, and only as fast as consumed, thus insuring maximum evaporation per pound of coal fired with a minimum of smoke and ashpan losses.

The accompanying illustration shows the river towboat C. F. RICHARDSON, built by the John Eichleay Jr. Co., Pittsburgh, for the West Kentucky Coal Co. The vessel was completed in 1921 and is now in service on the Mississippi river between Vicksburg, Miss. and Paducah, Ky. Her principal particulars are: Length,

What the Owner Knows

SOME of the practical advantages of mechanical firing are stated in a letter to the editor, dated May 13, 1929, *from C. F. Richardson, president of the West Kentucky Coal Co., Paducah, Ky., owner of the towboat* C. F. RICHARDSON. *He said in part:*

A material reduction in the fuel bill can be made for coal burning steamboats by equipping them with mechanical stokers. This will reduce the number of men employed and in addition it will be possible to burn 1¼*-inch screenings and still maintain maximum steam pressure at all times.*

The steam pressure recording chart on the river towboat C. F. RICHARDSON, *on upstream towing, is just as good, if not better, than on any oil burning craft. This boat frequently makes a trip from Vicksburg, Miss., to Paducah, Ky., requiring* 16 *days' time with a full tow, with the throttle never closed day or night, and it is very unusual to find a variation in the steam pressure of* 15 *pounds.*

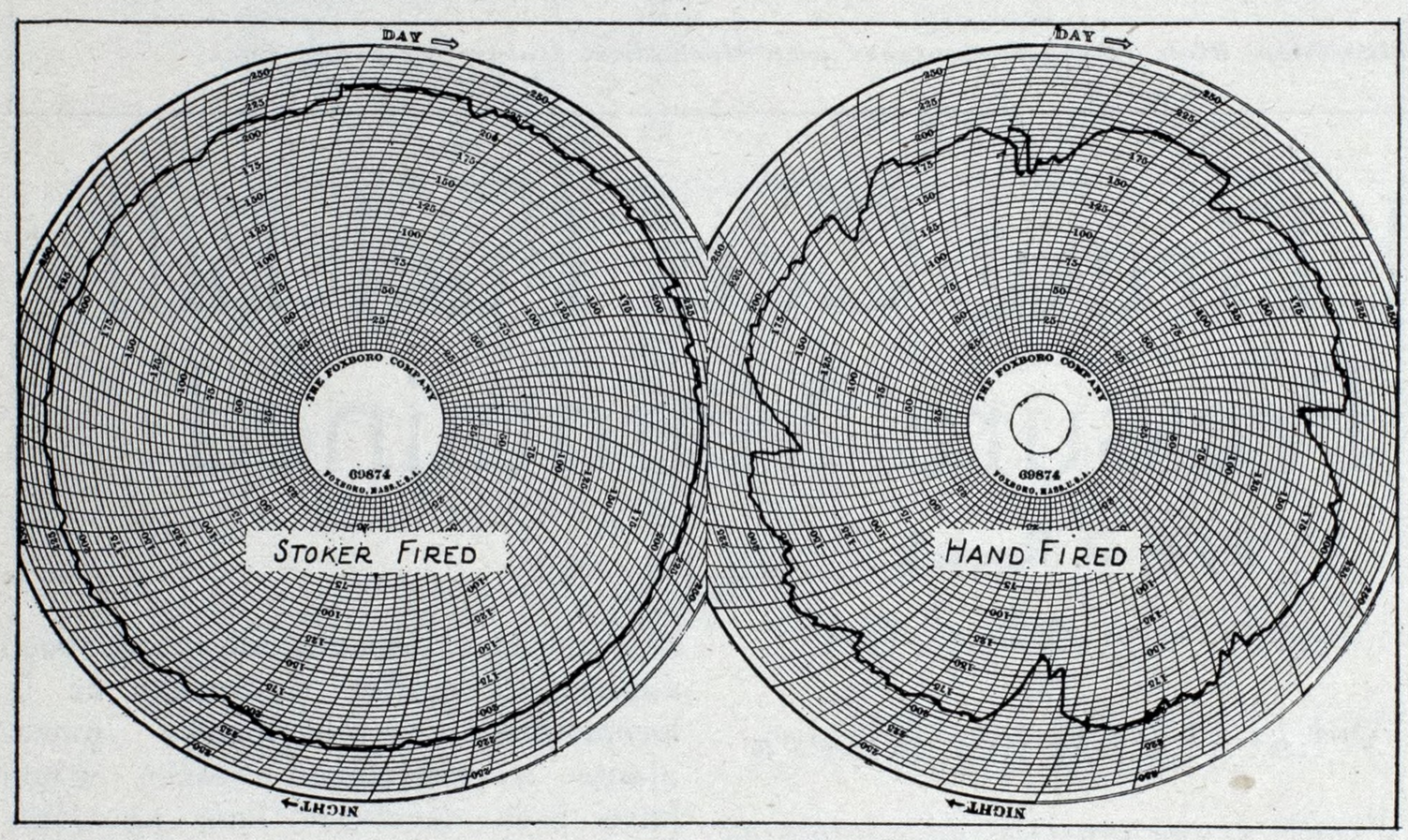
I have paid special attention to the steam pressure charts, and frequently for several days on upstream towing, which is the most severe test that any steam operating craft can be put to, there will not be a variation in pressure of over five or six pounds during the entire time.

The author, F. P. Roesch, is sales manager of The Standard Stoker Co. Inc., Chicago. He is a member of the American Society of Mechanical Engineers. This article was prepared for MARINE REVIEW at the suggestion of E. L. Lannert, deputy smoke commissioner, Cleveland.

254 feet; beam, 52 feet; equipped with two compound condensing steam engines with cylinders 21½ x 46 inches in diameter and 9 feet stroke; six return flue, river type boilers, 42 inches in diameter, 28 feet long, rated at 1600 horsepower at 215 pounds pressure, arranged in two batteries of three boilers each, built by Fowler-Wolfe Co., Paducah, Ky. The steam is superheated to a total temperature of 60 degrees Fahr. The boat with its tow will cover 188,708 square feet of river surface or 4½ acres. The up stream trip takes from 16 to 17 days without a stop. The fuel now used is West Kentucky 1¼-inch screenings.

When the boat was placed in service trouble was experienced in maintaining steam pressure. The diagram on this page shows typical pressure cards giving boiler pressure before and after stokers were applied. On account of the difficulty in maintaining steam pressure a stoker of the type illustrated on page 36 was applied to the port battery in 1922. The results were so satisfactory that another stoker was applied to the starboard battery early in 1923. The same stokers are still in operation.

The stoker installation in the towboat RICHARDSON consists of two units driven by simple two-cylinder reciprocating, double acting, low speed steam engines. The conveyors extend forward under the coal bunkers. As the conveyor screws revolve the coal is carried aft toward the furnace, any oversized lumps being reduced to firing sizes—about 2½-inch cubes as it is fed through the crusher—and finally discharged over a flat horizontal firing table, from whence it is distributed evenly over the entire surface by means of steam jet distributors. The distribution is controlled by five globe valves and the jets are arranged to enable the operator to vary the quantity of coal delivered to any part of the fuel bed at will. The delivery elbow extending through the furnace grates is surrounded by a conical grate protecting the discharge elbow against the furnace heat and at the same time providing the top or supplementary air required for complete combustion and smoke elimination. Speed of the stoker and delivery of fuel can be regulated to suit requirements, and where the demand on the boilers is constant or uniform the stoker delivery and distribution can be adjusted and set to correspond. Regardless of the fact that the furnace under each battery is 13 feet 6 inches wide, that is athwartships, and 5 feet 6 inches long, fore and aft, and that the discharge elbow of the stoker comes up in the center, a perfectly even distribution of the coal is obtained over the entire grate area.



STEAM PRESSURE CHARTS FROM RIVER TOWBOAT C. F. RICHARDSON. AT LEFT—WITH STOKER FIRING. MARCH 19, 1929. AT RIGHT—HAND FIRING. APRIL, 1923

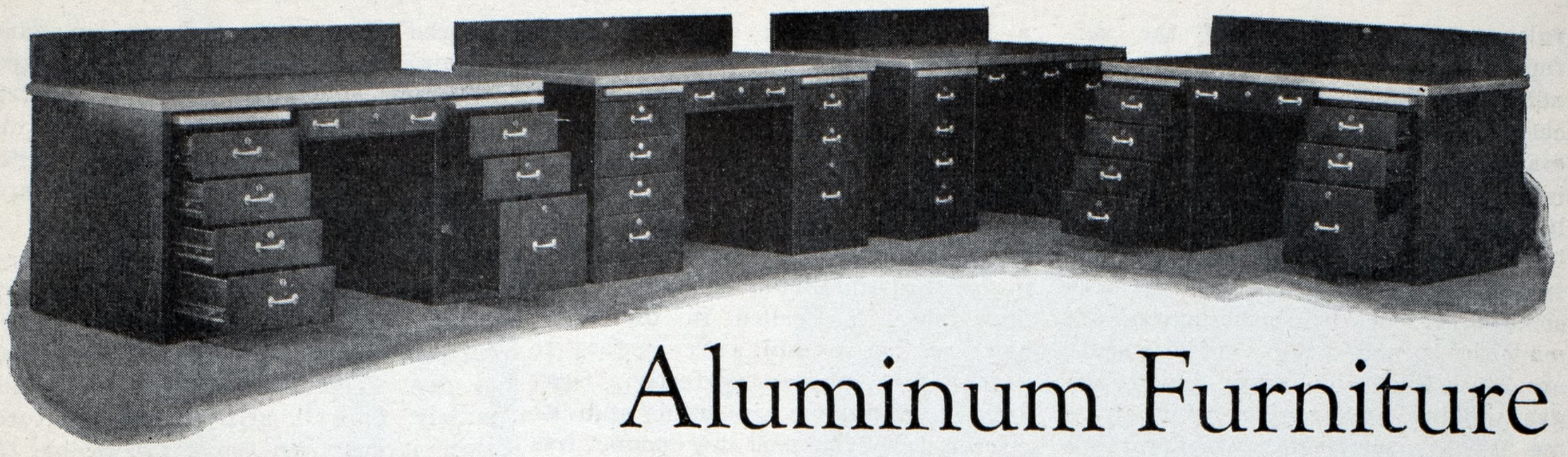
Referring to the pressure charts on this page it will be noted that before the stokers were fitted there was a marked drop in pressure about every three hours. These drops in pressure occurred during the period of fire cleaning. Under the method commonly employed in firing steamboats it was found necessary to clean the fires under each battery approximately every three hours. Referring to the pressure chart after the stokers were fitted it is very noticeable that there are no such drops in pressure. This is due to the fact that with proper stoker firing the fires are kept clean, and there is no need of periodical cleaning. Aside from shaking the grates occasionally the fires are not touched during an entire trip covering practically a period of two weeks continuous operation. If it should be necessary to either clean or draw the fires this can readily be done with the stoker installation in place as it does not in any way interfere either with cleaning fires or firing by hand.

When the stokers were first applied to the C. F. RICHARDSON this boat, like practically all other river boats was equipped with the old style of bar grate much the same as that used 50 or 60 years ago when the river boats burned wood. With this type of grate and with the stoker using maximum sized lumps not exceeding three-inch cubes, and one-inch cube being preferable, there would be quite an excessive ashpan loss unless the fire is maintained very thick. With screenings the losses would be particularly excessive. It was therefore decided to install the same type of grate commonly used in connection with locomotive stokers; that is, a flat shaking grate with small air openings equally distributed, the maximum size of these openings being ⅜-inch in diameter and the total area of the air openings equivalent to about 16 per cent of the total grate area. With grates of this type it is possible to maintain a fire about two inches deep, the grate itself acting as a restriction against the inflow of more air than is necessary for complete combustion. With the old type of grate it was necessary to build up the fire thick enough or heavy enough to serve the same purpose. Under these conditions the flow of air through the fire was regulated by the depth of the fire.

By using the proper grate in connection with stoker equipment and maintaining the fire at a minimum thickness the formation of clinkers and the necessity of frequent fire cleaning is avoided. In practice it is simply necessary to shake the grates lightly occasionally just enough to discharge any ash accumulations into the ash pit. Induced draft is used on the RICHARDSON.

Outside of the stoker engine itself the only wearing parts on the type of equipment installed on the C. F. RICHARDSON are the flights on the helicoid conveyor located under what is termed the crushing zone. Where screenings are used so that no crushing is necessary there would be no wear on the conveyor screw except that incidental to the conveying of the coal. As these screws are made of cast steel with hardened flights there is but little wear, the amount depending on the amount of coal delivered. In ordinary operations the conveyor screws will run about 18 months before it becomes necessary

(*Continued on Page* 52)



Aluminum Furniture Proves Successful on Warships

By Commander F. G. Crisp
Shop Superintendent, Norfolk Navy Yard

NAVAL engineers have devoted much study to the use of aluminum or aluminum alloys in place of heavier or less durable material. Aluminum serves particularly well in the place of wood, first because of the decreasing supply of wood and second, because of its lightness and resistance to fire. Until recently the substitution of aluminum for steel had been considered only where saving of weight was of primary importance. It was the lightness of the metal which first aroused the interest of naval designers. But the lack of strength of aluminum as compared to steel and the belief that it was more subject to corrosion presented serious drawbacks to its use. While this metal has been used to some extent on naval vessels for a considerable period of time, it was used only because it was the best material available even considering its supposed disadvantages.

The naval limitation of arms conference resulted in a more careful study of the usefulness of aluminum on board ship. The heart of the limitations agreed upon is the fixed limit in displacement, and naturally that country which could build the best ship within the limits set, had the advantage. It was obvious that the best way would be to reduce to a minimum the weight of all desired essentials in the way of equipment without sacrificing strength. Every pound so saved can be utilized to increase the number of guns, the speed, fuel capacity or any one or more of the offensive or defensive qualities of the ship.

The purpose of this article is to describe and discuss the processes of manufacture of aluminum furniture as now carried out at the Norfolk navy yard and to show the advantages of the use of such furniture not only on naval vessels but in the merchant marine and for commercial purposes ashore.

Steel furniture has been used exclusively on naval vessels for 16 years. It was adopted because it was fire and vermin proof. It is heavy and unwieldly, particularly in the case of portable articles, such as mess room tables. Complete designs were developed and construction standardized to provide the lightest furniture that would stand up under service conditions. With the weight of such metal furniture on a battleship exceeding 100 tons an important saving in weight could be made if aluminum of the same thickness could be substituted for the steel as the resulting weight of the finished article would be only one-third of that of steel. Experiments were conducted with aluminum sheet of varying degrees of hardness and it was found that aluminum manganese 1½ per cent alloy—three-quarters hard—was the best material for the purpose. Actual construction of aluminum furniture showed that aluminum of the same thickness as steel could be substituted and was of sufficient strength. In practice, the only change from this direct substitution is the use of light stiffeners across the fronts and bottoms of large drawers, and reinforcement in the way of drawer pulls. The weight saving was real and to convince the navy department furniture was built and placed in service for several years prior to adoption. These service tests showed that it was satisfactory, durable and no more subject to greater deterioration, if properly protected, than steel.

Processes of fabrication of aluminum are practically identical with those used for steel. The metal is sheared in the same manner. It is essential that the shear blades be sharp and it is the practice at the Norfolk navy yard to shear aluminum in one machine reserved for that purpose. Punching and notching of sheared plates presents no difficulties. Forming is accomplished on brakes and with the same dies as for steel. When necessary to prevent scarring of the exterior surface, greased paper is inserted in the dies in such a manner as to protect the surface. As a

Light Weight Furniture

NECESSITY has been the primary incentive in the development of materials used in ship work. This is particularly true of the navy where limitations of one kind and another have forced designers to depart from accepted practice in order to overcome new problems. Most important is the matter of weight, the basis of the limitation of arms agreed upon by the naval powers. The experience of the navy in the design and manufacture of furniture is an interesting instance of weight reduction by the use of aluminum for shipboard use.

Can the lesson learned by the navy be applied to merchant work? It is clear that the question of less weight with equal strength is of importance in merchant ship design. The deadweight, or useful load carrying capacity, of any vessel will be increased if the structure of the vessel, its machinery and equipment can be reduced in weight. Every ton so saved means an additional ton of cargo. We therefore believe that this article in relating the experiences of the navy in the successful construction of light furniture will be of value and interest to those responsible for the earning capacity of merchant vessels.

rule a slight scarring of the surface is desired so that paint will adhere better at the edges. In the case of 180-degree bends where no cracking of metal is permissible, it is necessary to warm the metal slightly before forming. For ordinary brake work this is entirely unnecessary. As in the case of zinc and some other metals, scribe marks are made by pencil. Parts of furniture are assembled by seam, spot and gas welding, or by riveting if welding is not practicable. One or more rivets are used sometimes to supplement welding for those parts such as drawer fronts, subjected to the greatest strain.

Extensive experiments were conducted with spot welding of aluminum before this method of assembly was found satisfactory. Electrodes of various materials were tried, including chromium plated copper, but good results were obtained with the ordinary copper electrode and these are now used exclusively. It is necessary that the tips be kept bright, otherwise the metal will burn at the weld. Successful spot welding can be accomplished by any operator in a reasonable time. Current density must be adjusted to suit the work. It is the practice at Norfolk navy yard to apply fresh paint to the metal faying surfaces just prior to spot welding in order to make sure that these surfaces are properly protected. Paint is not essential to a good spot weld but it is believed that it helps and acts somewhat as a flux. An ordinary baking varnish is used for this purpose.

Extensive Use of Welding

Gas welding is used on aluminum only when absolutely necessary, because of the need of neutralizing the flux used. This flux is an alkali and contains flourides and chlorides which absorb moisture and are highly corrosive to aluminum unless removed immediately after welding. This is done by neutralizing in a 2 per cent HNO_3 solution which is then washed off by means of a steam jet or boiling water. The neutralization is repeated after the weld is finished, ground or filed.

The final assembly of parts is accomplished by machine screws or dowels in the usual manner and presents no difficulty. Either aluminum or steel machine screws and nuts are used. In the case of furniture for naval vessels and this would apply to merchant vessels where every precaution against corrosion must be taken, screws are coated with a mixture of water resisting varnish and Soya-bean oil prior to insertion. For a threaded hole an anti seize compound of zinc dust and petrolatum is used.

Parts of furniture prior to assembly are given a dip coat of baking varnish and paint is baked on at a temperature of 300 degrees Fahr. Paint will not adhere well to a highly polished aluminum surface. Aluminum sheet as rolled in the mills, however, has a dull gray surface to which paint adheres perfectly. Gray finished aluminum is used and its price is about a cent per pound less than for a bright finish. Dipping or flowing of paint for the first coat is desirable to make certain that all parts are thoroughly covered, the surface first being cleaned and freed from grease or oil. Glazing of surface and finished painting is carried on in a similar manner to steel. Each paint coat is baked on at temperatures depending on the paint used. When nitro cellulose coatings, which go very well on aluminum, are used, there is no necessity of baking. When these coatings are used at the Norfolk navy yard it is the practice to use a dipped baking varnish as a priming coat.

The accompanying illustrations show some of the articles of furniture made of aluminum for naval vessels. There are about 25 different articles of furniture manufactured of aluminum. While this furniture has been designed to suit the requirements of the naval service it is representative of furniture required on merchant vessels and in commercial offices and homes. There are doors, tables, cabinets, desks, bookcases, sideboards, etc. Office furniture of steel is well known and used extensively at the present time. It has also been used quite extensively in hotels and similar establishments. Always the greatest objection to steel furniture is the weight and an objectionable metallic sound when drawers are opened and shut. Neither of these objections apply to aluminum furniture.

Extensive tests were made by the navy department to determine the durability of aluminum. Doors of all types aboard ship are subjected to hard usage. So are also heavy portable articles such as tables, desks, and cabinets. The heavier the article, the rougher it is handled and the greater the resulting damage. Would aluminum stand up under such conditions? Where strength is not a consideration, it could be substituted at about one-third the weight of steel. It was found to be ideal for doors and the doors were durable because they were easily operated. If built of steel a 12-foot dining room extension table weighs 650 pounds and six boys are required to handle it. The same sized table of aluminum weighs only 225 pounds and can be handled by two mess boys. The results obtained with all other furniture of aluminum are equally satisfactory.

Based on current prices and considering weight the relative costs of sheet steel and aluminum for furniture and similar work are about two to one. This relation holds approximately for all articles of furniture since it has been found practicable to substitute aluminum for steel of the same material sizes. A considerable part of the excess cost of material can be made up by a lesser cost of labor in fabrication and assembly resulting in an approximately ten per cent greater cost for the finished article of aluminum. The cost of crating and freight will be less for the aluminum furniture because of its lighter weight.

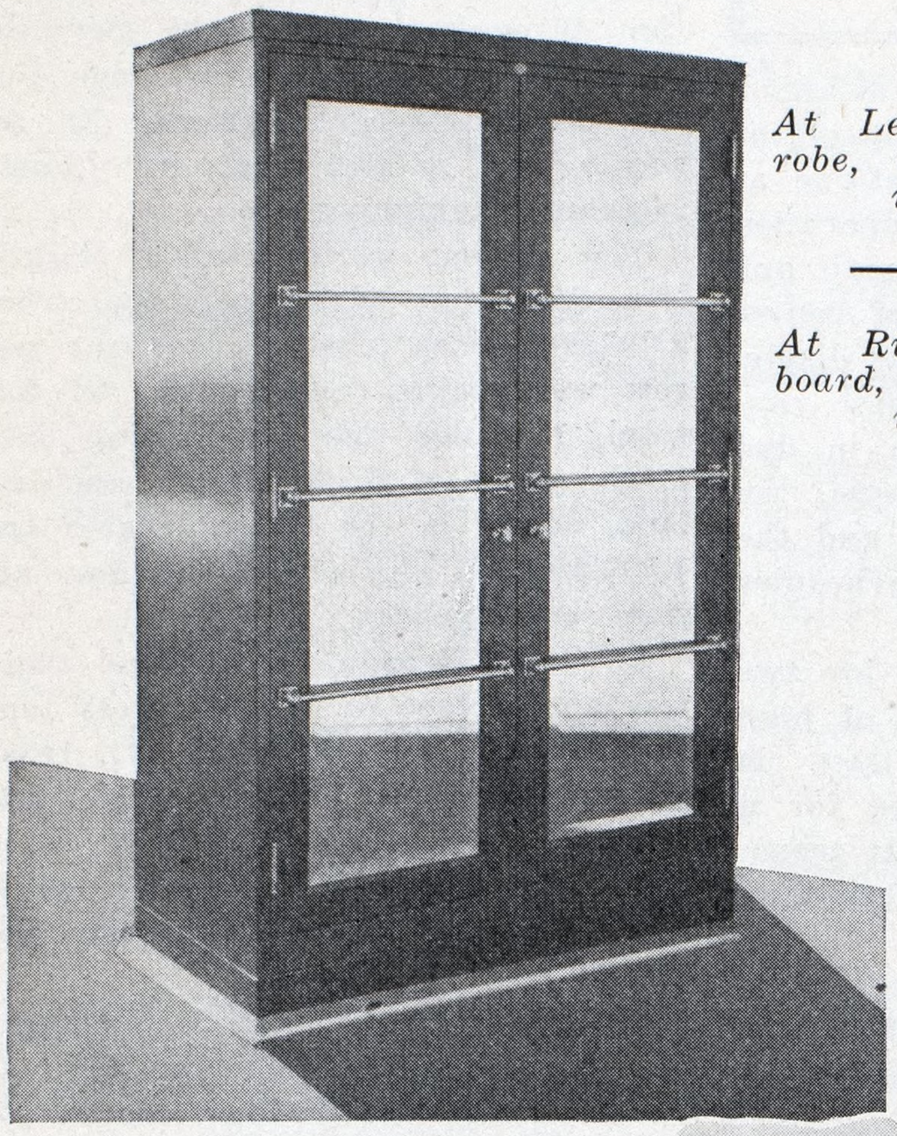
Grace Company Officials

At the annual meeting of W. R. Grace & Co. on May 10, Joseph P. Grace was elected chairman of the board and D. Stewart Iglehart, vice president, was elected president. Mr. Grace, who became president in 1907, is the eldest son of the late W. R. Grace who established the business in Peru in 1850 when that market was reached from New York only by sailing vessels rounding the Horn.

Under the leadership of Joseph P. Grace the business was extended from shipping and trading to include a wide variety of industrial enterprises in development of the natural resources of the countries of the West Coast of South America. The steamship service has been steadily expanded until the Grace organization controls seven distinct lines linking the Atlantic, Gulf and Pacific Coasts of the United States with the West Coast of Central and South America.

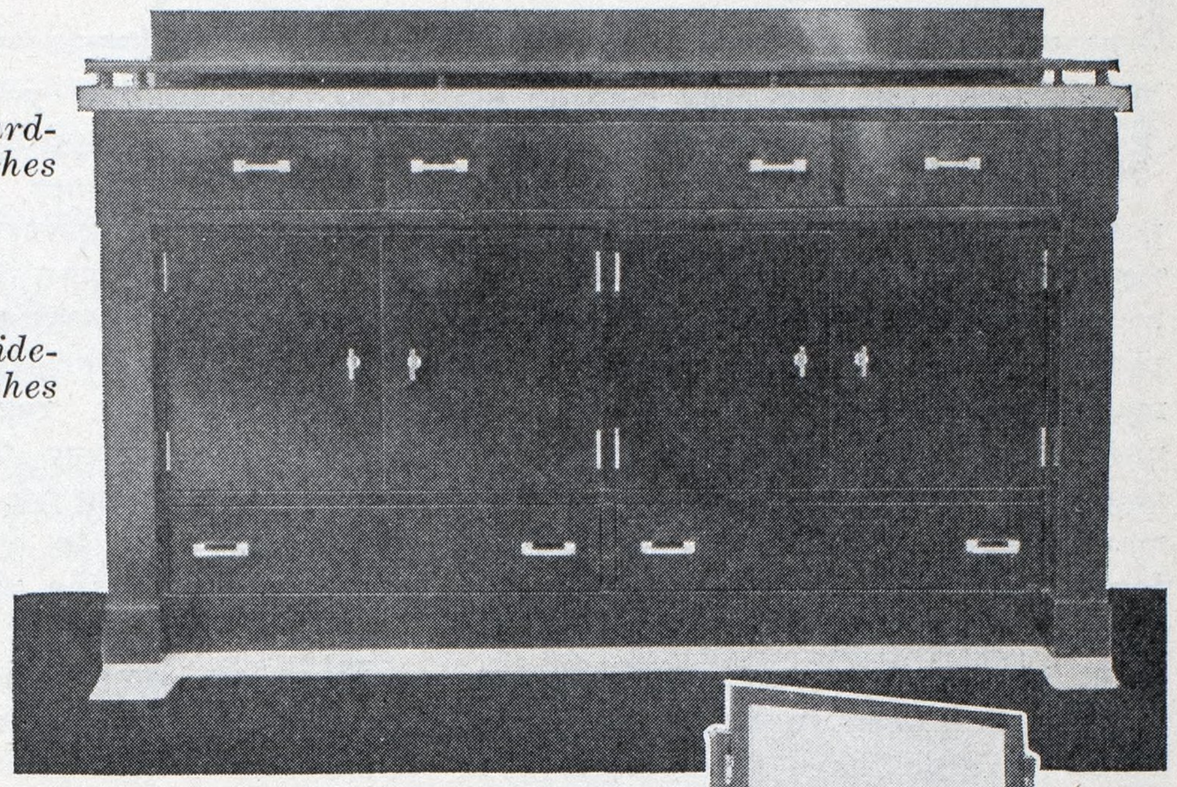
Mr. Iglehart joined the company upon graduation from Columbia in 1894. He was one of a group of young men who were trained in the business by W. R. Grace himself and who, after his death, broadened and expanded the firm's activities at a time when most of the old American foreign trading firms were turning to domestic enterprises. Mr. Iglehart spent many years in South America, mastered the detail of commercial and industrial operations and the language and made himself a part of the life of the people among whom he lived, a rather unsual course for young Americans although often followed by Europeans.

Warship Furniture Made of Aluminum



At Left—Wardrobe, 48 inches wide

At Right—Sideboard, 72 inches wide



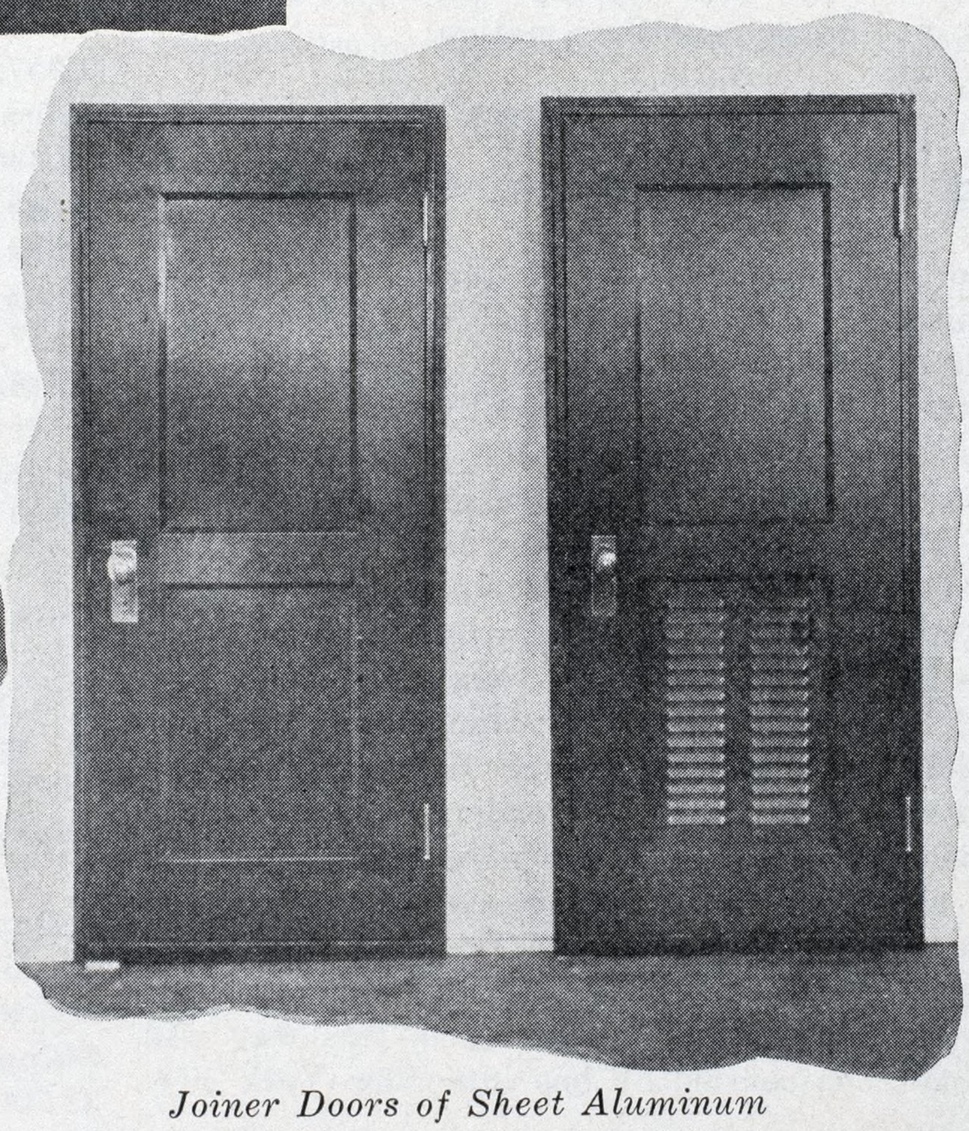
Some samples of Aluminum Furniture for ship use, manufactured at the Norfolk Navy Yard during 1928



Chiffonier

Below — Standardized Round Table

Below—Single Berth for Ship Officers' use



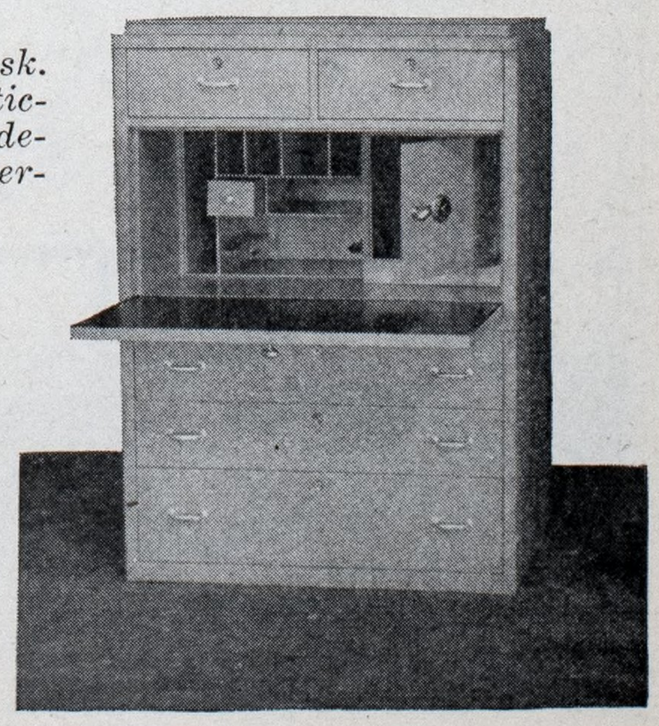
Joiner Doors of Sheet Aluminum



Above — Standardized Rectangular Table



At Right—Service Desk. Can be used for practically all of the ship's departments requiring clerical work



Mail Contracts Awarded

UNDER the merchant marine act of 1928 the post office department is authorized to enter into mail contracts with private American steamship companies maintaining services between American and foreign ports. Awards are made on recommendation of the shipping board, and under the law, have already been made to many companies. An enumeration of all the mail contracts in force last fall was published in the November 1928 issue of MARINE REVIEW. Since then some of these contracts have been modified and additional awards have been made. A revised, corrected and up-to-date list of mail contracts entered into by the postoffice department with private American steamship companies, complete up to May 15, 1929, is published herewith on the next page.

Though the United States lines is now privately owned and operated, no mail contract has yet been awarded. The LEVIATHAN and other ships of the United States Lines Inc. continue as they did under government operation to carry large quantities of mail and an appropriate payment is of course made for this service. It is likely, however, that a regular mail contract will be given this line in due course, stipulating as others do, the annual payment to be made and the requirements in the way of schedules and new ships.

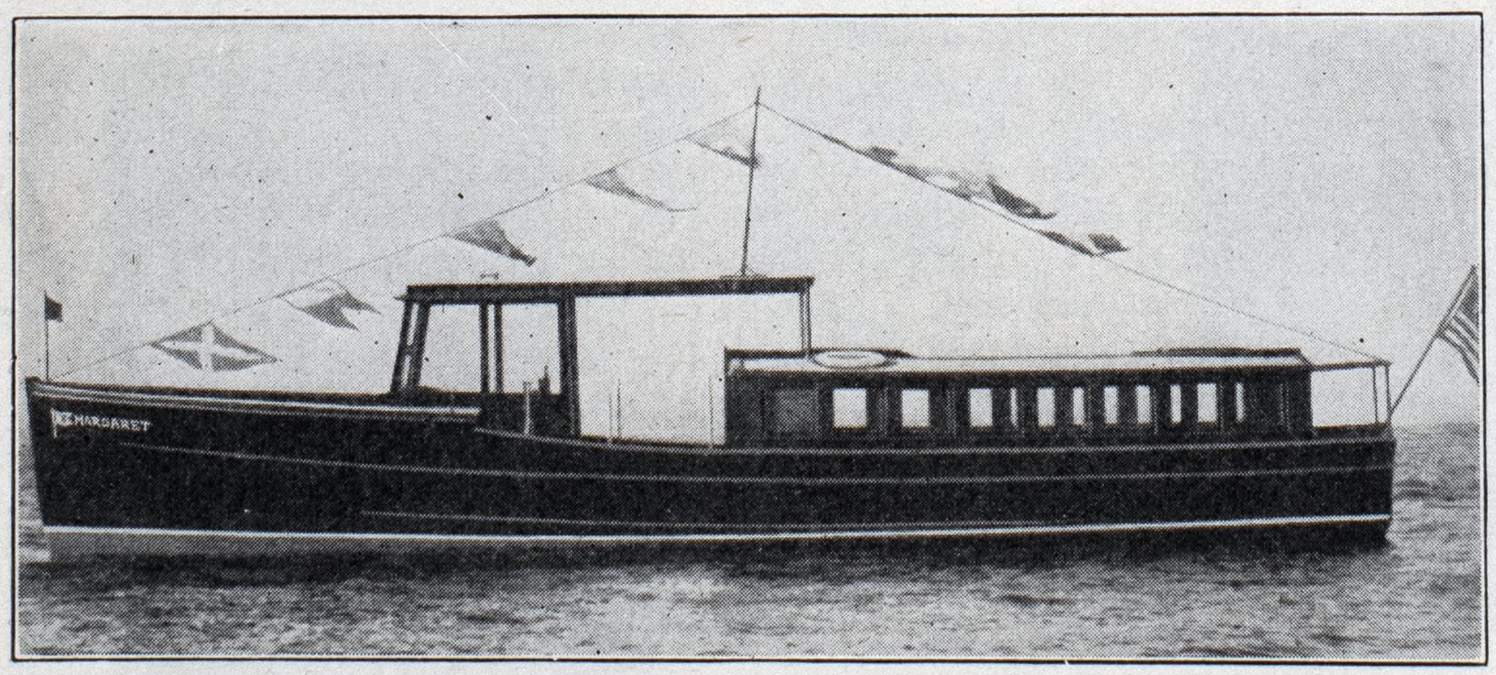
Plans are now under way for two luxurious transatlantic liners of high speed to run with the LEVIATHAN. It is also understood that plans for a number of lesser vessels for the transatlantic service of the same company are under consideration.

All this means the beginning of the building up of a merchant marine of a size and quality appropriate for a large maritime nation.

A New Steamship Tender

THE first tender ever built for a steamship line in the United States was recently completed by Lamb & O'Connell at the Victory plant in Squantum, Mass. The tender was designed by Howard & Munro, Boston, for the Eastern Steamship Lines Inc. Every precaution has been taken to insure maximum safety. She is 50 feet long and has a beam of 12½ feet. There are 4 water-tight bulkheads and the engine is a Standard diesel engine, which uses diesel fuel oil. The craft has a CO_2 fire-fighting equipment as well as a powerful air whistle for use in fog. She has a carrying capacity of about 50 persons.

The purpose of the tender is somewhat akin to the service rendered to transatlantic lines at French and Mediterranean ports where the various liners are usually met by a tender and passengers embark and disembark by the use of a tender. The Eastern Steamship lines by utilizing this idea of additional service have produced an innovation in this country. When on foggy mornings the various Sound steamers are not able to proceed through Hell gate to New York city, the tender will take those who desire to keep early morning appointments off the white boats when they anchor at Whitestone, L. I., to a special landing at Druer's Park. Passengers disembarking in this way will be carried by bus into New York city.



STEAMSHIP TENDER MARGARET RECENTLY COMPLETED FOR THE EASTERN STEAMSHIP LINES INC. FOR TAKING PASSENGERS FROM SHIP TO SHORE

World Shipbuilding Shows a Steady Increase

Merchant shipping under construction throughout the world increased by more than 200,000 gross tons during the quarter ended March 31, according to a statement by Lloyd's register of shipping.

The present world total is slightly less than that of a year ago, when 2,893,000 gross tons of merchant vessels were being constructed. Of this total, 1,441,000 tons were being built in the yards of Great Britain and Ireland, 56,000 in the United States and 1,596,000 in all other maritime nations combined.

In Great Britain and Ireland there was an increase of 114,000 gross tons over the quarter ended Dec. 31, 1928; and in the United States there was a gain of 48,000 gross tons, or more than 100 per cent. Smaller gains were made by Germany, Japan and Russia.

Conditions in the past two quarters are shown by the following figures: Great Britain and Ireland, March 31, 1,357,375 gross tons; Dec. 31, 1,242,794 gross tons. United States, March 31, 96,438 gross tons; Dec. 31, 47,849 gross tons. Other countries, March 31, 1,383,999 gross tons; Dec. 31, 1,327,258 gross tons. World totals, March 31, 2,837,812 gross tons; and Dec. 31, 2,618,001 gross tons.

New work begun by the shipyards during the last quarter was more than 150,000 gross tons in excess of the vessels launched. The new tonnage of steamers and motorships on which construction was commenced, however, was 15,000 tons less than in the last quarter of 1928, while the volume of tonnage launched was approximately equal for both quarters.

Contract for the sale of the Gulf Brazil River Plate line, which was awarded recently to the Mississippi Shipping Co. of New Orleans for $2,700,000 was signed at the shipping board offices on May 17. T. V. O'Connor, shipping board chairman, signed for the board in his capacity as president of the Merchant Fleet Corp. and Thomas F. Cunningham and N. O. Pedrick, president and vice president, respectively, of the Mississippi Shipping Co., signed for the purchaser.

The Gulf Brazil River Plate line has maintained a fleet of 12 steel cargo vessels in a service between Gulf ports of the United States and the principal ports of Brazil and Argentina. It was formerly operated for shipping board account by the firm which became its owner.

Mail Contracts Require New Ships

Twenty-four Mail Contracts Awarded—Means Payment of $11,-942,631 Annually—Forty-six Ships Must Be Built as Specified

Ocean Mail Contracts Awarded Under Merchant Marine Act of 1928, to American Steamship Companies Up to May 15, 1929

Route Number	Steamship Cos. & Termini	Class of Vessels Required at Start of Service	Annual Rate of Payment	Class of Vessels Required to be Substituted
4	**Munson Steamship Lines** New York to Buenos Aires	Class 3—18 knots—12,000 tons	$1,247,584.00	None
5	**Export Steamship Corp.** New York to Mediterranean and Black Sea Ports	Class 6—10 knots—4,000 tons	1,084,485.00	Four vessels of Class 5—13 knots—Ordered from New York Shipbuilding Co. Two to be laid down now, remaining two to follow on same ways.
6	**American South African Line** New York to Beira, Portuguese E. Africa	Class 6—10 knots—5,000 tons	248,280.00	One new vessel of Class 5—13 knots—6000 tons within two years and one additional after fifth year—First vessel, with diesel engines now underway by Sun Shipbuilding & Drydock Co.
8	**Grace Steamship Company** New York to Valparaiso	One of Class 4—16 knots Others of Class 5—13 knots	645,060.00	One new vessel of Class 4 within one year and one additional new vessel of same class within three years after award of contract—First vessel ordered from New York Shipbuilding Co.
10	**New York & Porto Rico SS Co.** San Juan to Santo Domingo City	Class 5—13 knots—8,000 tons	46,176,00	None
15	**Eastern Steamship Lines** Boston to Yarmouth	Class 3—19 knots—5,000 tons	225,624.00	None
16	**American Scantic Line** New York to Copenhagen	Class 6—10 knots—4,000 tons	538,800.00	Eight vessels of Class 6, 12 knots—4,800 tons, two within 15 months from award of contract; one additional within the succeeding 15 months and one additional each 18 months thereafter.
17	**American West African Line** New York to West African Ports	Class 6—10 knots—4,500 tons	291,300.00	Three vessels of Class 5—14 knots—4,000 tons. One within the fourth year from the award of contract and two during remainder of the contract.
18	**Atlantic & Caribbean Steam Navigation Co.** New York to Maracaibo	Two of Class 5—13 knots Others of Class 6—10 knots	389,714.00	After completion of the third year of the contract, one additional vessel of Class 5—13 knots—3,000 tons.
20	**New York & Cuba Mail SS Co.** New York to Havana	Class 4—16 knots—6,000 tons	370,032.00	Two new vessels of Class 3—18 knots. These two vessels turbine electric drive have been ordered from the Newport News Shipbuilding & Dry Dock Co.
21	**New York & Cuba Mail SS Co.** New York to Progreso	Class 5—14 knots—4,500 tons	419,536.00	One vessel of Class 5—15 knots—6,000 tons within three years from the award of the contract.
23	**Lykes Bros. Steamship Co.** Galveston to Santo Domingo	Class 6—10 knots	241,215.00	One vessel of Class 5—13 knots—4,000 tons within 4 years from award of contract.
22	**Gulf Mail Steamship Co.** New Orleans to Pregreso, Mexico	Class 6—10 knots—3000 tons	23,619.00	One vessel Class 5—13 knots within 3 years.
24	**The Oceanic Steamship Co.** San Francisco to Sydney	Class 4—16 knots—4,000 tons	692,886.00	Two new vessels of Class 3—18 knots. Three new vessels 585 feet in length, 18 knots speed to cost $7,000,000 each ordered from the Bethlehem Shipbuilding Corp.
25	**Dollar Steamship Line** San Francisco to Manila	Class 3—18 knots—12,000 tons	1,262,664.00	None
26	**Admiral Oriental Line** Seattle to Manila	Class 3—18 knots—12,000 tons	1,070,784.00	None
27	**Dollar Steamship Line** San Francisco to Colombo	Class 5—14 knots—10,000 tons	1,141,296.00	Four new vessels of Class 3—18 knots, 12,000 tons. Six new vessels, 653 feet in length, turbine electric machinery 21 knots, said to have been ordered, four from the Newport News Shipbuilding & Dry Dock Co. and two from the New York Shipbuilding Co. Terms of contract one within three years and one each successive two years thereafter.
28	**States Steamship Company** Portland to Manila	Class 6—10 knots—4,000 tons	399,540.00	Two vessels of Class 5—14 knots—4,000 tons. One during the 4th year of the contract and one during remainder of contract.
29	**States Steamship Company** Portland to Dairen, China	Class 6—10 knots—4,000 tons	179,610.00	One vessel of Class 5—14 knots—4,000 tons.
30	**Oceanic & Oriental Nav. Co.** Los Angeles to Auckland	Class 6—10 knots—4,000 tons	169,740.00	None
31	**Oceanic & Oriental Nav. Co.** Los Angeles to Melborune	Class 6—10 knots—4,000 tons	210,960.00	None
32	**American Line Steamship Corp. (Panama Pacific Line)** New York to Balboa, Canal Zone	Class 5—13 knots—7,500 tons	370,208.00	3 vessels of Class 3—18 knots, not less than 12,000 tons, not more than 3 years from beginning of contract term.
33	**South Atlantic SS Co. of Del.** Savannah, Ga. via Brest to Liverpool; Savannah, Ga, via Plymouth to Bremen	Class 6—10 knots—4,900 tons	364,995.00	3 vessels of Class 6—12 knots—3,000 tons; one during 4th year; one during 7th year; one during 9th year.
34	**Pacific Argentine Brazil Line** San Francisco and Los Angeles via Bahia Blanca to Buenos Aires	Class 6—10 knots—4,000 tons	308,523.00	Additional vessels of Class 6 to provide 18 trips per annum, not later than third year of contract.

Note: The aggregate annual sum in mail contracts up to May 15, 1929 as per the above table is $11,942,631.

River Transportation Increases

Irresistible Economic Forces Advance Use of Great Inland Waterways—Need More and Better Terminal Facilities with Rail Connection

By W. G. Gude

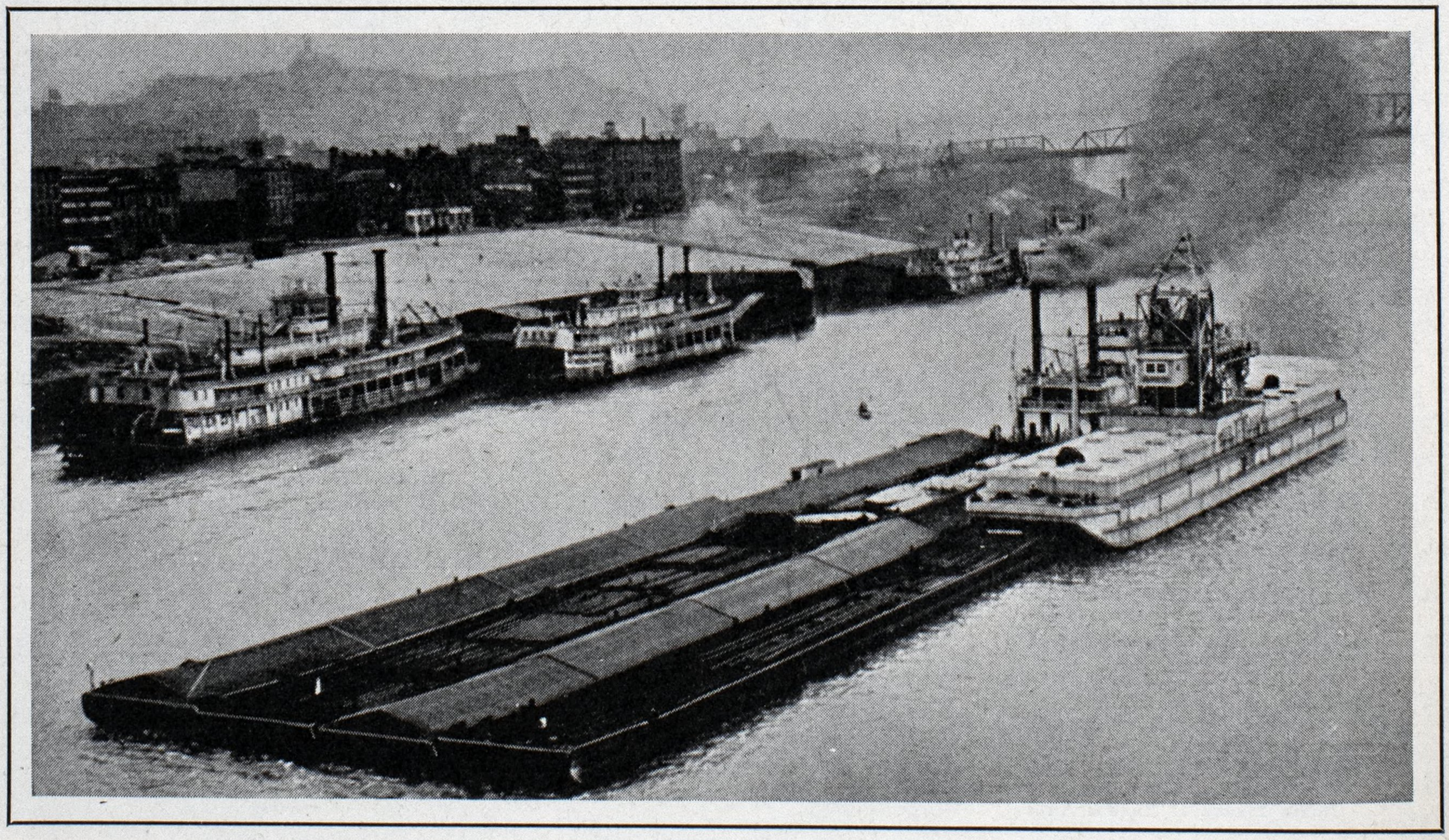
WORK on the slackwatering of a great medium of transportation—the Ohio river—practically is completed, and the 900 miles of this stream from Pittsburgh to Cairo, Ill., are available for year-round movement of a variety of freight. The next step is reaping the benefits of direct movement and low transportation costs from use of this waterway is building up of adequate shipping facilities—the establishment of barge lines and terminals. Progress along these lines is getting under way gradually.

It is not to be inferred, however, that traffic over the Ohio already is not of considerable proportions. In the Pittsburgh harbor alone are some 89 steamboats, 60 smaller towboats, 2000 barges, 24 sand dredges and 10 dipper dredges. The freight movement over the Ohio river in recent years has exceeded 20,000,000 tons annually, while shipments over the Monongahela river, a tributary, have been in excess of 25,000,000 tons. Traffic in coal, sand and gravel, however, comprises 85 per cent of the total freight of these two streams, and these commodities are moved over comparatively short distances. Iron and steel products are the leading items in the through movement from Pittsburgh to the South and Southwest. The bulk of this traffic is carried on by privately owned lines. Considerable expansion remains to be done to establish transportation facilities that will extend to the small and large shippers of other products the benefits of a dependable river route. Included in such developments, proponents of wide-scale utilization of the Ohio maintain, is the establishment of joint rail and river rates and equitable divisions of revenue between all-rail carriers and barge lines having river-rail terminal facilities.

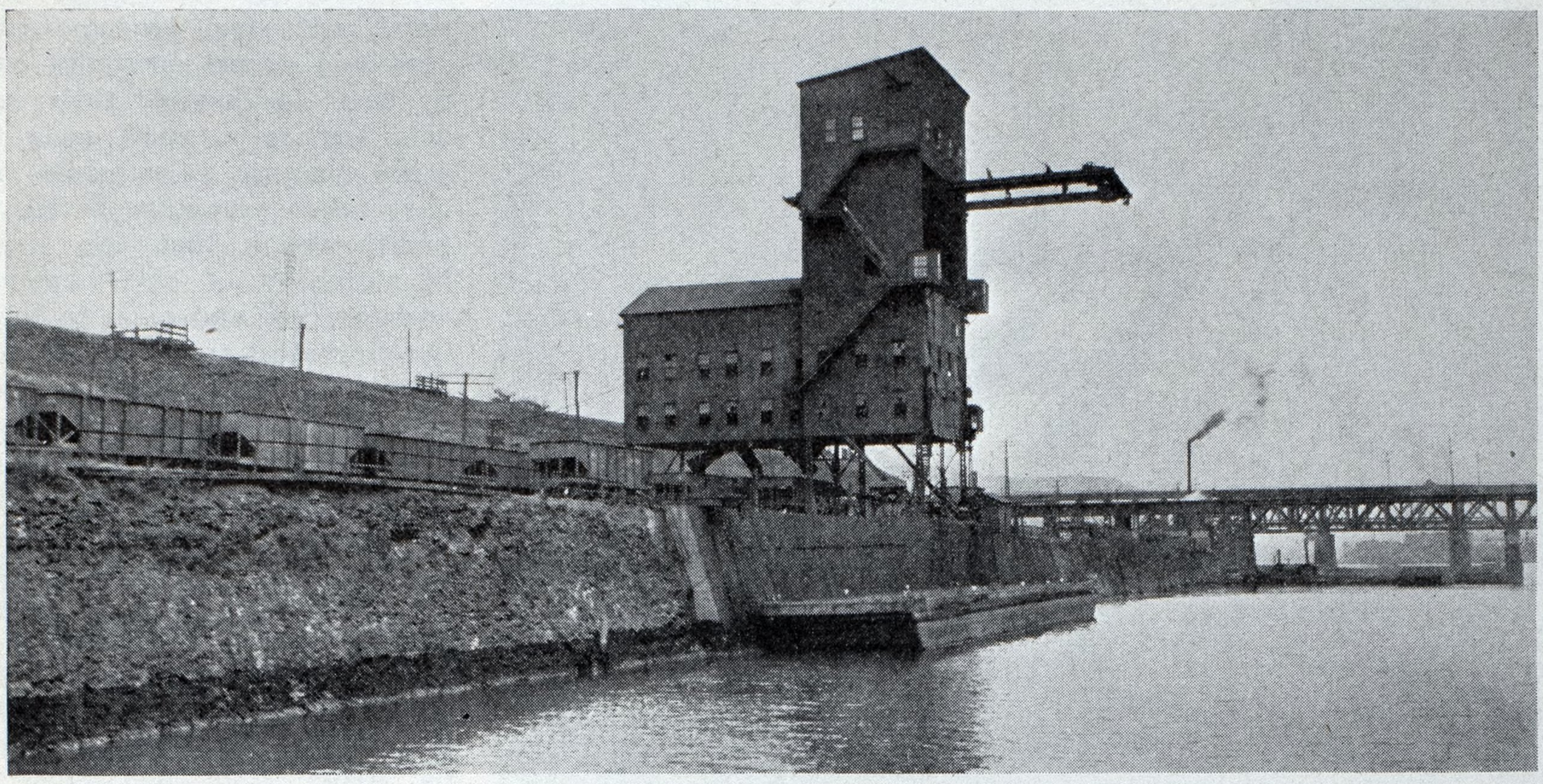
Anticipate Great Future Growth

Looking into the future, river men see a tremendous growth in traffic. Speaking before the Ohio Valley Improvement association at its annual convention in Pittsburgh last fall, the prediction was made by Lachlan Macleay, secretary of the Mississippi Valley association at St. Louis, that great barge line tows carrying 10,000 tons of wheat from the Middle West on port-to-port rates from St. Louis to Pittsburgh would be meeting the competition of the present grain movements by the Great Lakes. These, together with barge cargoes of cotton and sugar from the South, he said, would form the return movement in exchange for the cargoes of iron and steel products and cement down the Ohio to the Mississippi.

"We want to see the sugar and cotton and rice and lumber from Mississippi, Louisiana and Arkansas come into the river ports of Cincinnati and Pittsburgh for transport by rail to the centers of consumption and manufacture," he continued. "We believe that by this means cotton can be moved to the mills of New England at a rate saving which will enable New England mills to meet the competition of the world. This is no idle dream and its reasonableness is being proved by the operations at present on the Ohio and Mississippi rivers from New Orleans and Mem-



First Tow of Steel Products Down the Ohio and Mississippi Rivers—October 1921—by Jones & Laughlin



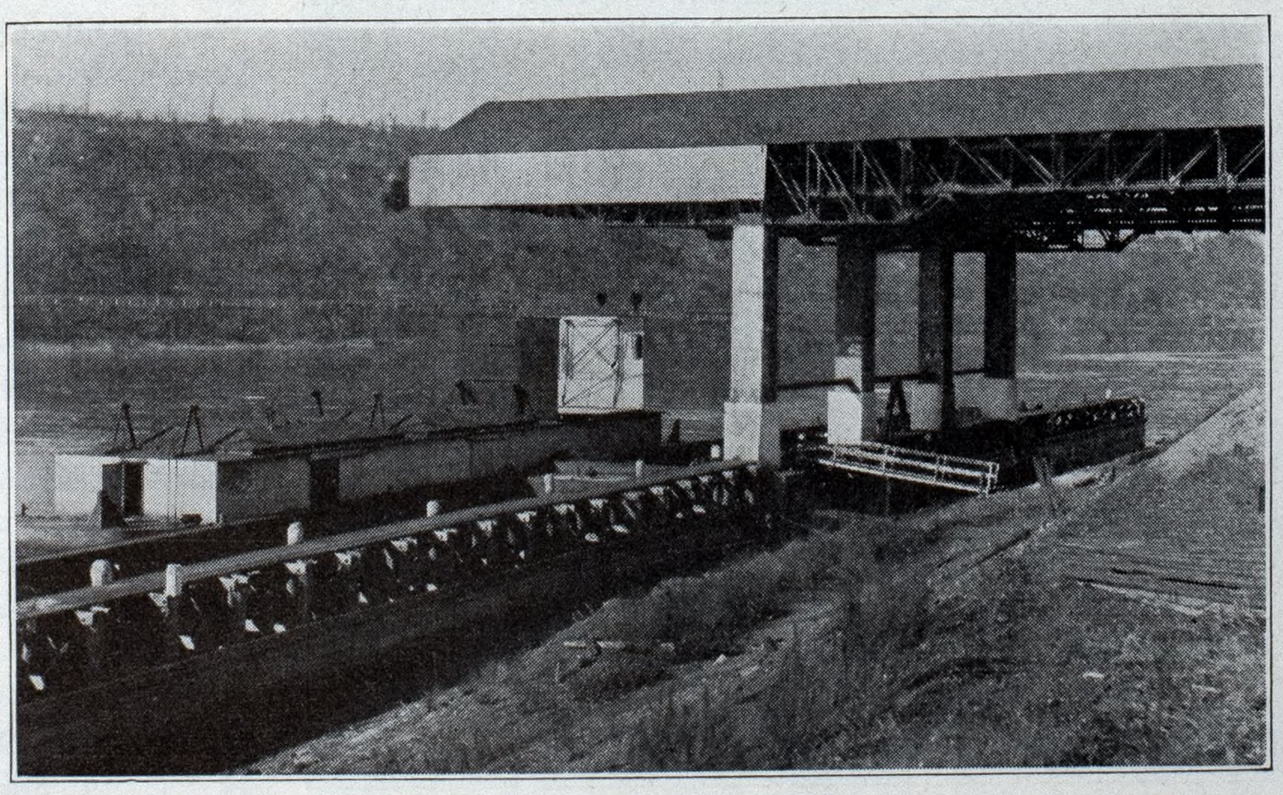
Dock at Duquesne, Pa., for Unloading Coal from River Barges to Railroad Cars—Owned by Union Railroad

phis to St. Louis, Cincinnati and Pittsburgh. Eventually we shall see barge lines under private operations as common carriers, transporting the products of the farm, factory and mine at rates as low per ton-mile as are now in effect on the Great Lakes and the coastwise steamer lines between north Atlantic and gulf ports."

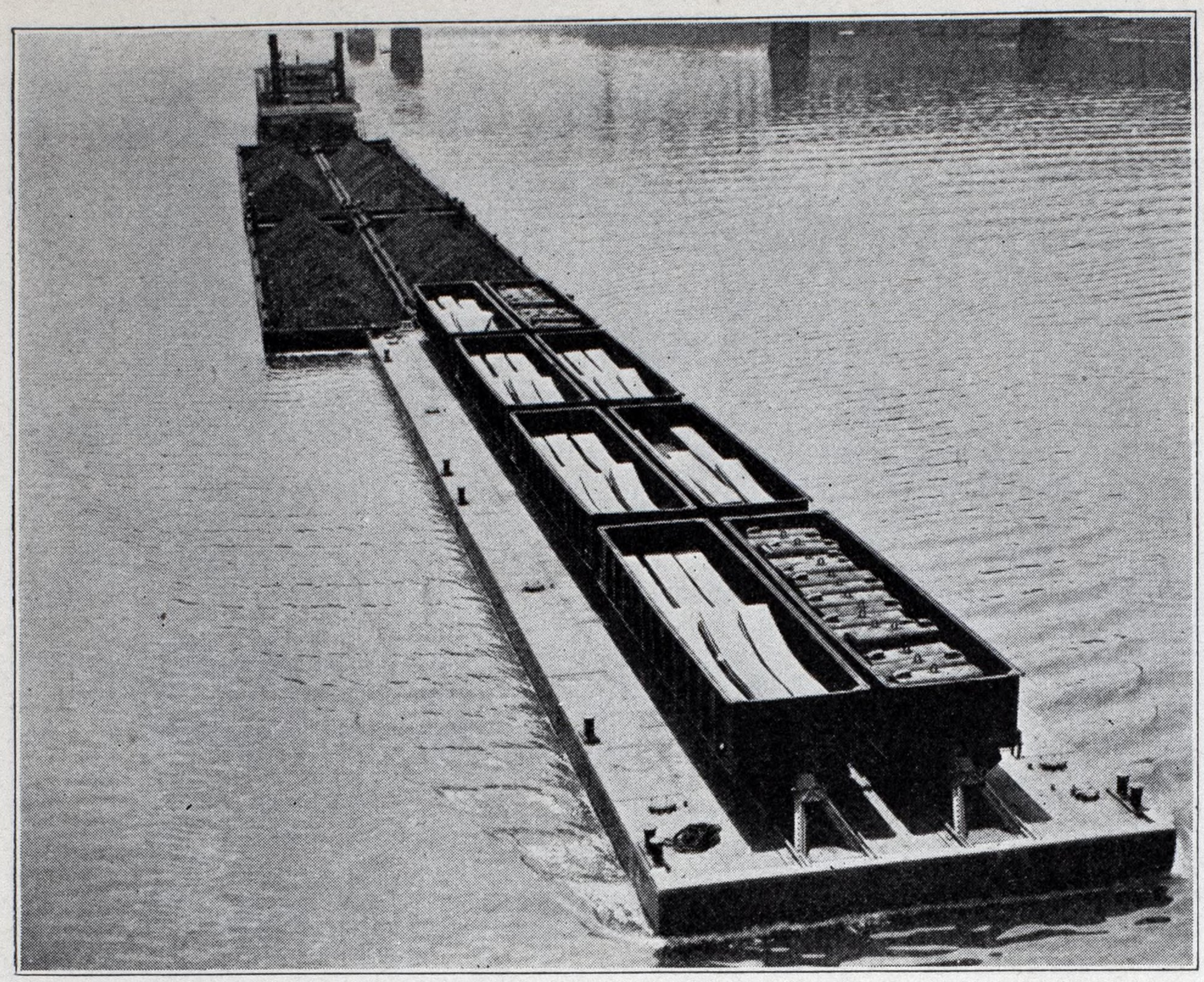
Lines Mainly Industrial Carriers

The bulk of river traffic in the Pittsburgh district is accounted for by plants located along the banks of the Monongahela, Ohio and Allegheny rivers, and is carried on largely by private lines. Coal, which constitutes the most active commodity, is moved in large tonnage from mines to the various steel mills. Coal shipments over the Monongahela river alone, between Fairmont, W. Va., and Pittsburgh, a distance of 127 miles, amount to more than 20,000,000 tons annually. Coal traffic over the Ohio river as far as 96 miles from Pittsburgh approximates 5,000,000 tons. The annual movement of sand and gravel in the Pittsburgh district totals more than 6,000,000 tons, while about 2,400,000 tons of iron and steel are transported in a year.

Several public carriers furnish regular service from the head of the Ohio to the South and West. The American Barge line and Union Barge line are the largest independent lines engaged in river traffic from Pittsburgh to the Mississippi and the Gulf. These lines furnish towboats for companies owning barges in addition to operating their own fleets of carriers. The former is the only line with regular service between Pittsburgh and New Orleans. This line operates 55 barges and boats. Of the ten towboats, six are steam-driven and four are the diesel type. Barges of the American line include the covered and open or hopper type, tank barges for liquid cargo, and combination tank and cargo barges with capacities ranging from 400 to 1000 tons. The company recently placed an order with the Howard Shipyard & Dock Co., Jeffersonville, Ind., for the construction of four specially designed combination tank and cargo type barges to be used in the Pittsburgh and New Orleans trade. These barges will be capable of carrying steel and wire products, with a cargo of oil in the hold at the same time. The American line maintains a weekly schedule of shipment of 6 to 14 barges from Pittsburgh to New Orleans. The trip of 2000 miles to the southern gulf port requires from 18 to 21 days, with a slightly longer time for the return journey, depending upon freight carried. Time of haul between other points, such as Cincinnati, Louisville, and St. Louis varies proportionately. Principal commodities hauled are manufactured iron and steel products, including tin plate, pipe, nails, wire, structural shapes and steel sheets, crude oil, creosote oil, tar, sugar, coffee and canned goods. The American Barge line operates a terminal at Glassport, Pa., on the Monongahela river, 17.5 miles above Pittsburgh, to which inland companies, not-



AMERICAN BARGE LINE TERMINAL AT GLASSPORT, PA. ON MONONGAHELA RIVER, 17.5 MILES ABOVE PITTSBURGH. FREIGHT BY RAIL FROM INLAND POINTS TRANS-SHIPPED TO BARGES FOR OHIO AND MISSISSIPPI



CARFERRY OPERATED BETWEEN PITTSBURGH AND ALIQUIPPA PLANTS OF JONES & LAUGHLIN STEEL CORP. FOR TRANSFER OF FREIGHT CARS LOADED WITH RAW AND SEMIFINISHED MATERIAL

ably the Bethlehem Steel Co. at Johnstown, ship freight by rail for trans-shipment down the Ohio and Mississippi. This terminal is equipped with three 5-ton cranes for transferring material from freight cars to barges.

The Union Barge line operates a fleet of 27 barges and 5 steamboats between Pittsburgh and Memphis, making three trips a month. Six of these barges are of the closed type for transporting certain products that must be protected from the elements, such as petroleum, steel sheets and tin plate. The Union Barge line recently made arrangements with the Jones & Laughlin Steel Corp. to handle the increased river transportation of this Pittsburgh steel producer, and will take one tow a month, consisting of ten barges carrying 10,000 tons, to various Ohio and Mississippi river points.



RIVER TERMINAL OF CARNEGIE STEEL CO. AT MUNHALL, PA. MAINLY STEEL PRODUCTS AND CEMENT. UNDER WHARF CHUTE USED TO TRANSFER CEMENT FROM CARS TO BARGES

River traffic in and around Pittsburgh was heavy a number of years before regular transportation down the Ohio and Mississippi was instituted, and steel producers, coal and sand and gravel operators have built up fleets for hauling their own products and on a small scale those of other concerns. Companies that long have taken advantage of the low cost transportation that the rivers offer in movement of bulk raw materials, such as coal and coke, to their Pittsburgh district plants, have been the leaders in utilizing barge service for shipping finished products to the South, West and Southwest.

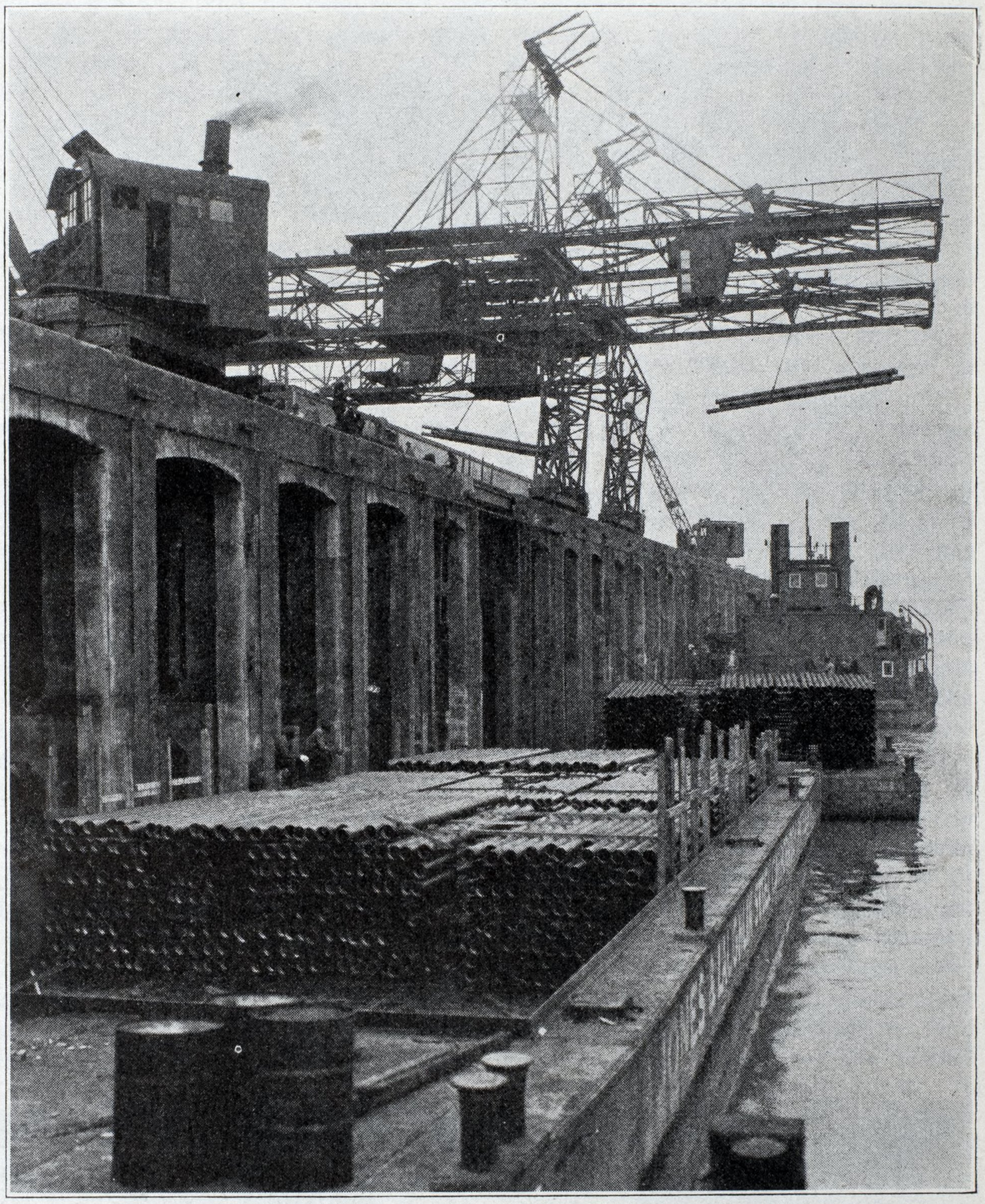
Operates Largest Inland Fleet

The river transportation service of the Carnegie Steel Co. came into existence as a transportation adjunct to the by-product coke plant at Clairton, Pa., the largest installation of its kind in existence. Coal is moved by barge from the mines to this plant and to river terminals for delivery in cars to plants on the rivers having no barge unloading facilities. Coke is delivered to furnace plants along the Ohio and Allegheny rivers. River service gradually was expanded and with the institution in 1922 of the hauling of finished steel products as far south as New Orleans, additional floating equipment was added to the fleet. The marine department of the Carnegie company now operates the largest fleet on inland rivers, following its recent merger with equipment of the American Steel & Wire Co., and in 1928 carried more than 13,500,000 tons on the Monongahela and Ohio rivers. The fleet consists of 15 stern wheel steamers and 450 steel barges. Of the latter, 423 are open top barges for carrying coal, coke, etc., 26 are cargo barges and 2 are acid barges. Coal barges have a capacity of 850 net tons when loaded to 8½-foot draft. The company makes one trip per month from Pittsburgh to New Orleans and intermediate points, carrying finished products, and one trip per boat per day from Monongahela river coal mines to Clairton and Duquesne, Pa. Miscellaneous commodities are moved between mills along the Monongahela river and Ohio river plants at Bellaire and Mingo Junction, O., and the American Bridge Co. plant at Ambridge, Pa., including steel plates, shapes, bars, pig iron, ingot molds, flue dust, coke dust, scrap and stirring rods.

Terminals are operated at various plants and mines of the Carnegie and H. C. Frick Coke companies with facilities for handling the heavy traffic carried on. At the Clairton by-

product coke plant, for instance, four double hoists, each having two 6-ton grab buckets, are used for unloading coal from barges. A conveyor loads coke from cars to barges and there is equipment for pumping acid from tank barges to the plant and for loading creosote oil or tar into tank barges. At Duquesne, Pa., a terminal owned and operated by the Union railroad, a subsidiary of the United States Steel Corp., is equipped with five electrically operated locomotive cranes, of 5 tons capacity each, with magnet or grab bucket as accessories. These are used for unloading coal or other bulk commodities from barges and are available in emergency for loading steel or other material for shipment by barge. A central wharf at Munhall, Pa., is a general terminal for all plants on the Union railroad and is available for handling material from other Carnegie plants outside of the Pittsburgh district or for use by other Steel corporation subsidiaries on outbound shipments. Equipment consists of a gantry crane, with double hoist of 15 tons total capacity and magnet and under-wharf chutes for transferring cement from cars into barges. Additional terminals also are operated at both Clairton and Duquesne and at Bessemer, Pa., on the Monongahela river, blast furnace plants at Pittsburgh and Etna, Pa., on the Allegheny river, and at the Pittsburgh north side plant at Mingo Junction and Bellaire, O., on the Ohio river. Several docks are operated in connection with coal mines near the Monongahela river, with belt conveyor systems employed to move the fuel to the barges. At the Colonial dock, 48 miles above Pittsburgh, coal is moved from mines located an average distance of six miles from the river by a belt conveyor system from a central point. The longest conveyor belt in this system is 2439 feet, and it is the longest of the kind in the world.

The Jones & Laughlin Steel Corp., Pittsburgh, was the pioneer in development of the long haul to the West, South and Southwest, starting the first tow in 1921. This company now is shipping two tows of steel products monthly down the Ohio and Mississippi rivers—approximately 20,000 tons—for distribution to interior points by rail from its warehouses in Cincinnati and Memphis, as well as from St. Louis, New Orleans and other river ports. Through its subsidiary, the Vesta Coal Co., it operates 215 modern steel barges and eight towboats, seven of which are steam driven and one is diesel. Capacities of the barges vary from 450 to 900 tons, the latter being in the majority. Products carried are coal from the Vesta mines to the Jones & Laughlin mills and furnaces, and manufactured steel products from mills to customers in the South, West and Southwest by river and rail. Jones & Laughlin also operates a car ferry between the Pittsburgh and Aliquippa, Pa. works, a distance of about 20 miles, for the transfer of railroad freight cars loaded with material in the process of manufacture.



RIVER TERMINAL AT ST. LOUIS. TRANSFERRING STEEL PIPE FROM JONES & LAUGHLIN BARGES TO RAILROAD CARS FOR DELIVERY TO WESTERN OIL FIELDS

The Pittsburgh Steel Co. operates 50 barges and two steamboats, but only on short hauls of coal and coke. The longer movement of steel products usually is handled by one of the independent lines. The Hillman Transportation Co. moves coal for the Hillman Coal & Coke Co. from mines for distribution to lower river points, operating a fleet of 70 steel barges and 4 tow boats. In 1928 the Hillman fleet carried 1,250,000 tons of coal. The Pittsburgh Coal Co. also operates a large fleet. The Wheeling Steel Corp., through its subsidiary the La Belle Transportation Co., brings raw material to its plants in addition to shipping finished products to distributing centers. The Weirton Steel Co., Weirton, W. Va., and McKeesport Tin Plate Co., McKeesport, Pa., are other steel manufacturers that move their products via river barges. The Keystone Sand & Supply Co., Ohio River Sand Co., and Rodgers Sand Co. carry large tonnages of sand and gravel in their own floating equipment.

The Basic Products Co., subsidiary of the Davison Coke & Iron Co., Pittsburgh, through its fleet, the Basic Barge line, recently started transportation of cement via river from its plant at Kenova, W. Va., to the Pittsburgh district. The company employs 11 special cargo barges designed by the Dravo Contracting Co. This type of craft permits loading or unloading through either the hatches in the roof or through sliding doors across the deck. Eight of the

(*Continued on Page* 68)

Diesel Tug for Honolulu

AN ABLE seagoing tug built on the Pacific Coast, named the MIKIMIKI, recently completed its homeward bound trip, towing a 1000-ton steel barge from Seattle to Honolulu, a distance of 2569 miles, in 11 days and 14 hours. The MIKIMIKI, which is Hawaiian for "alert and ready to go," was built for Young Bros., Honolulu, by the Ballard Marine railway, Seattle, from designs by L. H. Coolidge. The new tug is equipped with two 560-horsepower 4-cylinder Fairbanks-Morse diesel engines and on the trial trip covered a measured mile at the rate of 10.84 knots at rated engine speed. The total fuel consumption for the trip to Honolulu was 13,000 gallons.

The MIKIMIKI is built of wood and has an overall length of 125 feet, a beam of 28 feet and a draft of 16 feet. In addition to the two main engines there is also a model 40 F-M diesel auxiliary generating set with built-in 40-kilowatt, 125-volt generator. On the opposite end of the engine from the generator is a clutch connected two stage 6¼ x 3⅛ x 5½-inch air compressor with a capacity of 50 cubic feet.

Other auxiliary equipment consists of a 6 x 10-inch duplex piston pattern power pump operating at 150 pounds pressure which is gear driven by a 20 horsepower 1200 revolutions per minute type direct current motor mounted for fire and auxiliary pump purposes. This pump has a 5-inch suction leading to the deck with a hose connection for pumping out ships, barges and for similar service.

There is also a 1½-inch centrifugal pump direct connected to a 2 horsepower, 1800 revolutions per minute type motor which handles the sanitary system and is also used for bilge pumping and washing down the deck. There is also an auxiliary circulating water pump unit which is made up of a 3-inch centrifugal pump direct connected to a 7½ horsepower, 1800 revolutions per minute motor.

The auxiliary lubricating oil circulating pump is a rotary pattern, direct connected to a 7½ horsepower, 1750 revolutions per minute motor. This unit has a capacity of 1000 gallons per minute. A DeLaval centrifuge driven by a 2 horsepower, 1200 revolutions per minute direct current motor is used for reclaiming the oil from the lubricating system and the piston cooling. This unit is located on the port side forward of the engines and there is a 6-kilowatt bayonet type oil heater mounted above it. The lubricating oil standards and coolers are located on vertical steel braces forward of the fuel oil tanks and are interconnected in such a manner as to permit their use with either engine. Wrought iron pipe is used throughout the engine room with extra heavy for all air lines; 4-inch pipe is used for both circulating water and oil and 2½ or 2-inch for air lines. Powell valves are used exclusively for water, oil and air and are of the extra heavy type for the latter service.

A 420 gallons per hour home water system is located forward on top of the fuel tank. It takes fresh water from a 3000-gallon tank located forward under forecastle and pumps it into a pressure tank for service. It is automatic in operation with a pressure range of 10 pounds to 20 pounds, assuring fresh water throughout the ship at all times.

Five air tanks constructed in accordance with requirements of the American Bureau of Shipping are installed; four 30 inch x 144 inch located aft, two on starboard side and two on port side; one 16 inch x 36 inch located under deck on starboard side aft. All tanks are interconnected and in turn with air line leading to air compressors on main engines and auxiliary. One tank is kept locked for emergency to start auxiliary engine in case pressure in main tank is lost.

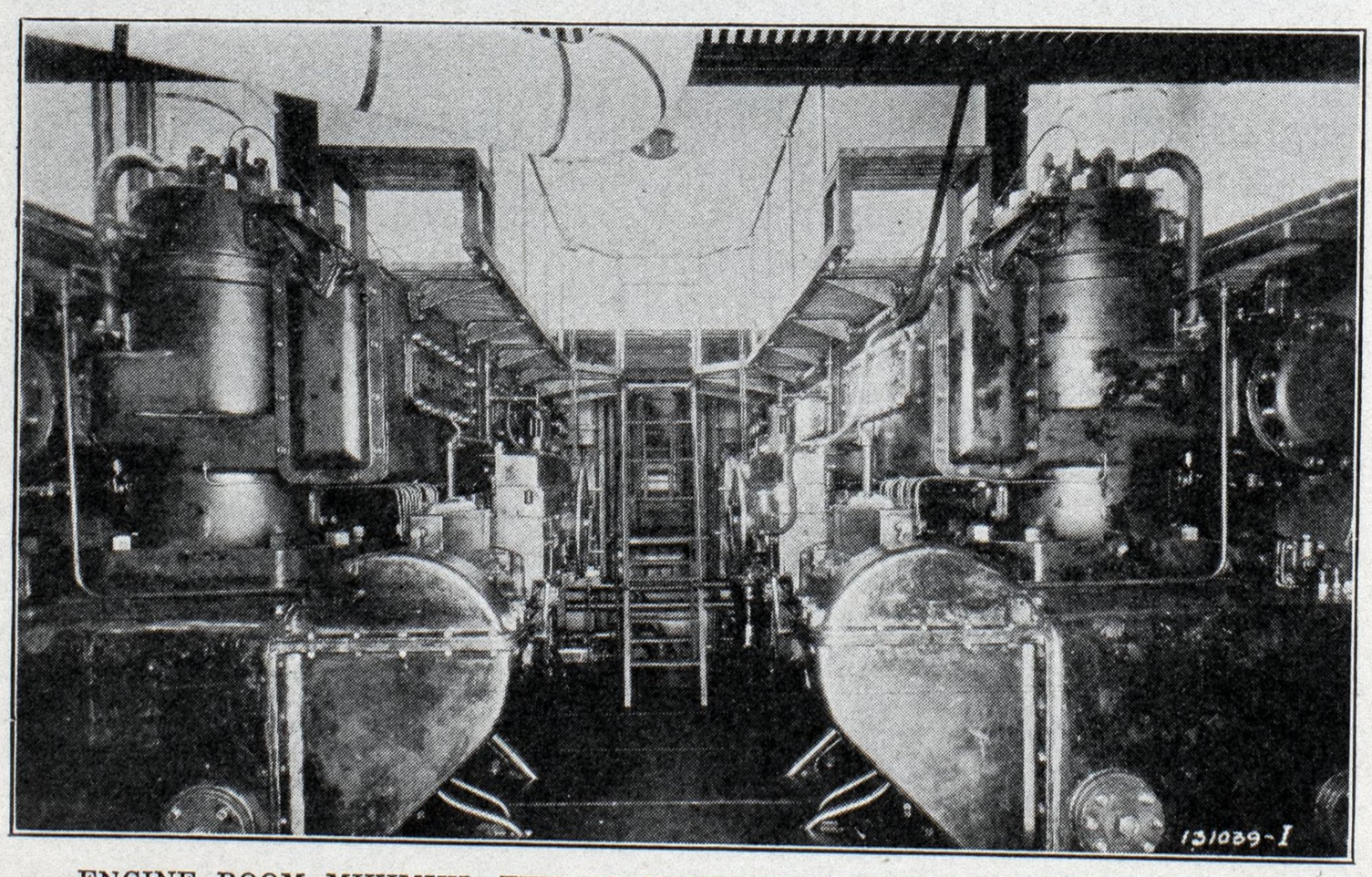
Three tanks are used for fuel oil: Two in wings of vessel slightly forward of amidships, each tank of approximately 9500 gallons capacity; and one tank aft of after engine room bulkhead holding approximately 11,000 gallons. All fuel oil pumps on main and auxiliary engines take the fuel from the manifold line in to the engines and overflows back into same line.

Strainers are provided in fuel oil manifold line ahead of engine pump suctions. Gage boards are located on both main engines with their respective gages and indicating scavenger air, circulating water and oil pressure, tachometer and pyrometer. Telegraph and speaking tubes from pilot house and after deck are conveniently located on each engine. The switchboard is located in center of after bulkhead with air and fire pump gages and clock on top.

A lubricating oil tank of 900 gallons capacity is located in the center of the ship, fore and aft, between the two forward fuel oil tanks, with batteries of 100 cells, 300 ampere hour capacity on top of it. The batteries are covered with boards which forms a passage way from engine room to forward part of ship.

The exhaust from the main engines is carried through 14-inch lines and 5-inch on auxiliary to a special combination water base and silencer located on the bridge deck. They are provided with expansion joints located at outlet of manifold on engines. When engines are working at full load, a test indicated zero back-pressure. The combination water base and silencer is 6 feet 3½ inches in diameter, 3 feet 6 inches high with partition for exhaust of each engine. Openings in partition permit one water base for all engines.

The MIKIMIKI is modern in every



ENGINE ROOM MIKIMIKI—TWO 560-HOREPOWER FAIRBANKS-MORSE DIESELS

respect, being equipped with motor driven towing machine, electric winch forward, electric steering machinery and up-to-date wireless and radio. The hull, speaking generally, is built with the arduous ocean service it must face, in mind. The members show strength and a general stout character, and are chiefly of Douglas fir supplied by the Bolcom Canal Lumber Co., Seattle, but all deck beams and top timbers and the upper portion of the main frames are of yellow Alaskan cedar furnished by Eugene Taylor, Vancouver, B. C. The bulwarks are built up solidly, heavily edge-bolted and capped with 4-inch iron-bark railing. From the stern of the main house around the after bulwarks a ¼-inch steel plating is capped over the railing as a protection against chafing by the wire hawsers.

Officers' and crew's quarters are spacious and comfortable. Her complement is captain, two deck officers, four men forward, chief engineer, two assistants and two oilers, cook and messboy.

The bulk of the Young Bros.' towing work in the Hawaiian Islands is in connection with the pineapple industry. This industry had grown beyond the barge and towboat capacity of the company's extensive fleet until the MIKIMIKI was added. John A. Young, vice president and general manager of Young Bros., came to the United States to handle the details connected with the building of the new tug. The two 560 horsepower units are the largest diesel engines in the fleet, as the MAHOE, the second largest tug, is equipped with two 360 horsepower units. This new tug is one of the finest diesel powered tugs in the world. It is also one of the largest of its type in existence.



MIKIMIKI—TWIN SCREW DIESEL TUG FOR SERVICE IN HAWAIIAN ISLANDS

Repairing Fire Damage on S. S. Europa

IN THE morning of March 26, 1929, it was reported that a fire of serious proportions had broken out on the steamer EUROPA of the North-German Lloyd, at that time under construction at the shipyard of Blohm & Voss, Hamburg, Outward appearances, particularly the large amount of smoke lead to the conclusion that a catastrophe impended.

The Hamburg fire department together with the fire department of the shipyard promptly arrived on the scene and through their unceasing efforts the fire was under control by the afternoon and all further danger to the vessel was averted. An investigation, which was immediately begun to determine the extent of the damage caused by the fire, disclosed that it was considerable. However, the reports which were spread on account of the large amount of smoke, and further magnified by the sensational press despatches, that the ship was "a total loss," were far from true.

The shipyard and marine experts confirmed the fact that the ship's hull did not suffer any damage below the main deck, except where it had been attacked by the fire in some isolated spots along the bow. The engine room equipment and boiler room were entirely undamaged, and a third of the after section of the superstructure clear to the topmost deck, likewise remained unscathed.

Just as soon as the preliminaries for docking the EUROPA were completed the steamer was placed in drydock on April 14. No damage was discovered below the waterline. After a thorough examination which was made in conjunction with the leading experts of the German Lloyd, the rebuilding of all damaged sections of the ship's hull was immediately started. The vessel will remain in dry dock until the hull has reached the stage of construction where it can be launched again.

The rebuilding methods carried out on the hull in dry dock make it possible to do this work in just the same manner as it was performed during the building of the vessel on the ways. In this way new construction quality of the ship's hull upon leaving the dock is assured.

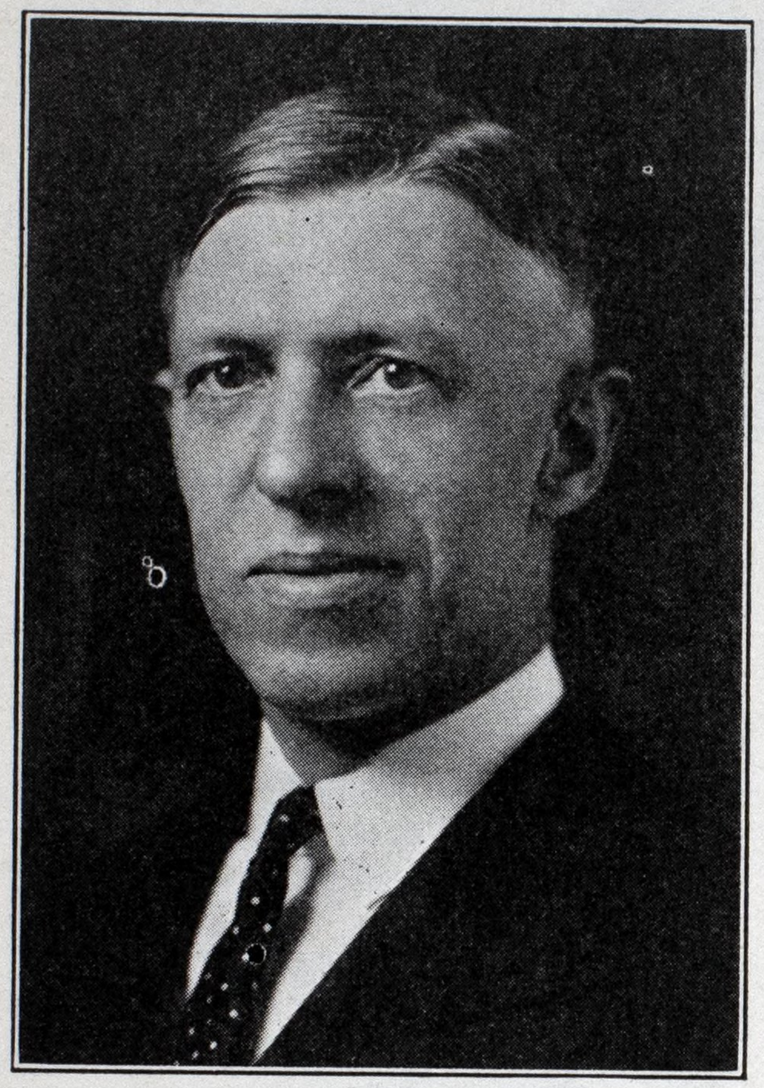
It is figured that the vessel will again leave the dock the latter part of July. The further construction work on the ship (in which fortunately the engine and boiler rooms were not reached by the fire and therefore the only work they will require will be that of keeping them in condition) after leaving the dock is planned so as to have the ship ready for delivery and be able to go into service by spring of next year.

The damage, as the investigation disclosed, will be completely repaired, so that the operation and seaworthiness of the vessel will in no manner be affected. Putting the ship in commission will of course be delayed through the unfortunate mishap. In spite of the above, the North German Lloyd will be in a position to offer a much improved steamer service to the United States, over that furnished in previous years, through putting into commission on July 16, of its new fast steamer BREMEN of 46,000 gross registered tons.

In the meantime, all the available resources of the Blohm & Voss shipyard, engineers, technicians and workmen, are busily engaged in removing all traces of damage from the S. S. EUROPA and in reducing as much as possible the delay in placing this large beautiful steamer in commission. When completed the S. S. EUROPA will not start on its run between Bremen and New York as a repaired vessel, but as a new ship in every respect.

Appointed President of Diesel Engine Co.

Edward B. Pollister, formerly second vice president and general manager, has been elected president and general manager of Busch-Sulzer Bros.-Diesel Engine Co., St. Louis. He succeeds August A. Busch, who has been elected chairman of the



Edward B. Pollister

President, Busch-Sulzer Bros. Diesel Engine Co.

board. The Busch-Sulzer Bros.-Diesel Engine Co. is one of the pioneers in the building of diesel engines in the United States, the original patents of Rudolph Diesel having been acquired by the company towards the end of the last century, and only a short time after the first experimental engine had been successfully tried out in Europe. This company is now one of the leaders in the diesel engine industry in the United States.

The new president of the company was born in Portland, Me., March 31, 1884, and comes from a family connected with maritime affairs. His father, the late Capt. George A. Pollister, served with the United States steamboat inspection service and was well known along the Atlantic seaboard. His mother is still living at Portland, Me. Mr. Pollister is a graduate of Portland high school and in 1902 entered the Massachusetts Institute of Technology where he attended for three years. After graduation he served successively with the New York Edison Co. in its engineering department and with the National Light, Heat & Power Co., New York, in management and construction work of Illinois properties including erection of a diesel power plant.

Since 1912 Mr. Pollister has been associated with the Busch-Sulzer Bros.-Diesel Engine Co. with the exception of the war period when he served two years in the army as captain of the three hundred nineteenth engineers, eighth division, with eleven months overseas. He first joined the company as sales representative, then became manager of northwest sales division, general sales manager and general manager, and now president. He is a member of several St. Louis clubs and of the Sons of Revolution.

William George Sickel

William George Sickel, former president of the United American Lines, Inc., and long affiliated with the Hamburg-American line, died recently aboard the ALBERT BALLIN at the age of 61. Mr. Sickel began his shipping career as a clerk in the Chicago office of the Atlantic Transport line, becoming western freight manager in 1901. He was connected with the International Mercantile Marine Co. for four years after its formation in 1902 and joined the Hamburg-American line in 1906 as assistant to the general manager, becoming vice director in 1912. Subsequently he served as senior member in the firm of Sickel, Meyer & Lederer, which for a time was American representative of the Hamburg-American line.

When the Hamburg-American line entered into an agreement with the Harriman shipping interests, Mr. Sickel was assistant to Chairman W. A. Harriman in the operation of the United American line, which maintained a joint service with the Hamburg-American line. In August, 1926, Mr. Sickel was elected president of the United American Lines, Inc., and served in that capacity until forced to relinquish his activities through ill health. He is survived by Mrs. Sickel and two daughters.

Carl E. Petersen has been appointed assistant to the vice president of the Newport News Shipbuilding & Dry Dock Co. with offices at 233 Broadway, New York city.

Captain A. E. S. Hambelton, former master of the White Star liner OLYMPIC, died recently in London after a long illness. He was born in 1862 and had retired from active service in 1923 after 50 years at sea. During the war he commanded the CELTIC and JUSTICIA and for his war service received the decoration of the commander of the British Empire.

Marine Superintendent New York Central

It has been reported that the New York Central railroad has the largest investment in harbor equipment of any company in the world. At any rate this company's floating equipment in the harbor of New York is very extensive as indicated by the fact that 26,000 cars are floated and 250,000 tons of freight is lightered each month. The position of marine superintendent in charge of this equipment and the marine end of these extensive operations is a post of great responsibility. George S. Clark, formerly assistant to the manager of the marine department of the New York Central lines, New York, was recently promoted to this position to fill the vacancy resulting from the death of Capt. Reginald Fay. The new marine superintendent was born at Cornwall-on-the-Hudson, New York, June 9, 1889, and graduated from New York university in 1912.

After graduation he joined the engineering staff of the city of New York in the capacity of civil engineer on the construction of the Catskill aqueduct. Later the same year he took position with the New York Central railroad.

Mr. Clark served in the office of



George S. Clark

Marine Superintendent, N. Y. Central

the vice president of the railroad from 1912 to 1917. The following five years, until 1922, he was in charge of corporate affairs of the Rutland railroad, after which he returned to New York and again served in the vice president's office from 1922 until 1924, when he was attached to the comptroller's office. He was appointed assistant to the manager of the marine department in 1926.

Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	626	2,677,963	606	2,547,409
March	576	2,428,002	599	2,587,030
February	534	2,345,973	550	2,391,154
January	528	2,416,692	543	2,385,658
December	554	2,369,709	559	2,342,928
November	516	2,237,046	550	2,418,097
October	596	2,666,360	589	2,571,403
September	545	2,424,887	543	2,362,154
August	580	2,533,877	622	2,733,727
July, 1928	602	2,526,107	564	2,415,168

Baltimore

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	158	471,851	156	465,710
March,	131	401,217	138	426,539
February	127	397,147	132	410,667
January	126	386,102	122	372,302
December	127	392,832	134	400,355
November	134	412,100	134	417,523
October	133	402,263	131	406,142
September	119	374,500	128	396,749
August	133	404,303	144	440,016
July, 1928	128	378,827	121	353,758

New Orleans

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	294	751,444	278	708,155
March	283	773,515	298	517,632
February	248	682,052	249	675,432
January	273	710,969	282	744,078
December	274	762,019	260	690,010
November	252	690,157	263	716,105
October	259	682,184	329	627,989
September	228	617,636	248	661,643
August	264	667,055	265	690,341
July, 1928	260	659,457	245	615,234

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April 1929	118	318,240	76	194,158
March	117	309,233	81	203,080
February	98	263,790	56	163,324
January	86	243,505	63	187,612
December	106	309,214	72	213,261
November	88	229,598	86	89,931
October	91	250,902	48	137,352
September	84	238,234	43	122,389
August	96	266,104	58	161,365
July, 1928	101	254,378	60	143,573

Norfolk and Newport News

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	20	54,399	73	215,664
March	22	55,442	84	217,780
February	20	55,902	58	155,238
January	18	36,737	61	154,970
December	32	73,123	90	223,258
November	19	58,171	77	209,023
October	12	33,817	66	173,729
September	21	64,366	69	178,508
August	19	50,096	83	208,639
July, 1928	15	33,548	81	212,471

Charleston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net. tonnage	—Clearances— No. ships	Net tonnage
April, 1929	24	62,976	26	62,467
March	14	37,470	18	46,087
February	26	78,237	26	66,648
January	23	54,709	25	57,589
December	20	46,569	17	43,041
November	22	56,983	22	50,043
October	24	59,136	26	61,673
September	21	60,956	22	54,537
August	24	62,574	26	63,874
July, 1928	26	59,204	27	61,976

Boston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	125	328,493	87	221,533
March,	90	305,532	59	209,077
February,	96	289,629	58	196,264
January	94	294,036	47	164,132
December	100	312,100	69	214,047
November	107	315,954	74	214,574
October	112	347,432	72	221,761
September	113	383,749	77	245,068
August	130	340,569	107	270,757
July, 1928	155	378,368	111	289,121

Jacksonville

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	15	33,734	13	27,662
March	20	25,950	16	21,897
February	17	27,851	9	13,422
January	16	19,754	14	28,046
December	13	17,657	7	9,510
November	26	64,406	27	67,621
October	23	55,147	22	53,094
September	40	89,032	42	94,981
August	37	85,186	34	83,694
July, 1928	30	81,634	31	79,222

Galveston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	36	82,330	93	294,062
March	33	62,486	77	221,143
February	37	96,127	81	256,077
January	45	133,396	106	347,297
December	45	129,285	107	355,592
November	49	150,205	109	351,063
October	41	110,825	135	420,534
September	26	69,433	98	313,816
August	31	91,959	78	261,804
July, 1928	41	91,686	68	196,424

Key West

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	79	77,934	75	77,672
March	77	82,370	76	96,935
February	84	104,667	73	90,947
January	82	98,373	79	99,243
December	79	79,816	72	79,354
November	98	81,666	101	82,863
October	120	111,450	116	106,139
September	84	60,079	86	62,698
August	91	73,771	89	69,532
July, 1928	86	65,838	88	67,720

Los Angeles

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	175	546,939	184	650,172
March	177	572,573	180	523,807
February	150	470,851	157	484,043
January	193	581,357	191	536,504
December	199	551,301	154	487,064
November	209	541,906	179	514,647
October	221	568,910	216	515,889
September	188	504,630	189	482,133
August	164	539,454	160	514,978
July, 1928	153	547,612	131	485,817

Portland, Me.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	20	45,922	21	48,999
March	15	36,185	15	38,415
February,	19	46,400	17	46,121
January	20	59,830	21	61,434
December	25	61,251	25	62,930
November	20	37,250	19	33,408
October	23	39,959	22	40,588
September	30	53,338	30	51,018
August	30	48,256	28	47,078
July, 1928	38	68,208	38	66,389

Mobile

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	102	213,941	77	174,116
March	102	220,251	105	264,084
February	85	202,594	69	164,847
January	83	186,978	79	168,403
December	100	234,963	89	212,341
November	91	203,865	77	184,537
October	89	185,031	71	166,606
September	85	209,709	74	193,661
August	90	186,097	78	178,036
July	101	209,990	82	189,008
June, 1928	85	176,088	82	178,337

San Francisco

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	173	673,174	153	606,246
March	176	655,851	174	692,407
February	153	603,008	130	484,085
January	135	587,423	142	560,239
December	155	607,902	152	582,612
November	157	504,269	157	589,810
October	165	620,117	155	596,750
September	180	623,999	175	579,262
August	185	674,832	164	643,965
July, 1928	147	662,437	122	454,802

Providence

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	5	20,267	5	17,898
March	5	19,121	5	21,902
February	2	5,891	4	17,323
January	7	24,095	4	17,289
December	6	20,741	8	32,974
November	10	35,147	9	20,551
October	6	14,667	9	20,551
September	5	18,895	3	12,777
August	7	28,611	4	19,978
July, 1928	8	26,920	7	25,451

Portland, Oreg.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	36	136,793	47	169,257
March	45	170,528	64	232,651
February	35	137,304	48	181,425
January	27	105,843	50	181,584
December	39	144,128	56	205,572
November	30	115,469	53	198,195
October	42	154,623	62	224,018
September	41	150,368	57	203,758
August	35	136,504	47	172,693
July, 1928	30	111,042	46	157,354

Seattle

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	62	264,744	61	254,647
March	57	234,394	59	248,901
February	53	222,462	55	225,789
January	60	242,464	73	290,077
December	62	249,729	63	259,823
November	68	285,564	75	306,605
October	62	245,420	60	243,778
September	57	229,718	66	254,503
August	55	220,858	53	228,378
July, 1928	64	261,850	58	228,946

Port Arthur

(Including Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1929	104	354,267	103	347,145
March	112	359,092	112	358,071
February	106	350,848	110	365,691
January	99	340,978	102	349,324
December	97	321,827	95	320,666
November	95	325,696	96	321,806
October	92	311,215	93	322,297
September	84	304,636	86	310,500
August	65	219,737	64	222,661
July, 1928, foreign	24	78,538	33	109,230

Note: The figures given in this table are for direct entrances and clearances. Additional vessels in foreign trade enter and clear from and to other American ports after original entry and before final departure. At the port of Philadelphia, for instance, additional vessels in the foreign trade in this category were 56 of 195,045 net tons entered and 71 of 232,254 net tons cleared for the month of April.

Mechanical Firing Used

(*Continued from Page* 38)

to build up the flights by autogenous welding. The valves and cylinders of the stoker engine are lubricated by means of a hydrostatic lubricator, and as the engine uses saturated steam the valve and cylinder wear is nominal. Crankshafts, connecting rods, crossheads, etc., are all enclosed in an oiltight casing and are lubricated by the splash system. If the proper oil level is maintained all of these parts will run over a year before any attention is necessary. The maintenance cost of the stoker is therefore low, considering the work performed. In the case of the stokers on the river towboat C. F. RICHARDSON during the past six years the total amount of repair parts would hardly exceed $300. If an equal amount is added for direct labor the total maintenance cost would be approximately $100 per year for the two stokers or $50 for each.

This type of stoker requires steam for its operation and the question naturally arises as to the amount of steam needed. Steam consumption will depend on the amount of coal delivered which again depends upon the operation of the boat. Generally speaking, it may be said that the total steam consumption for both stoker engine and distributor will come to about eight-tenths of 1 per cent of the total amount of steam generated. The condensate from the stoker engine can of course be returned if desired.

It is interesting to establish a tentative idea of the initial cost of equipment intended to show economy in operation. The adoption of this type of equipment should be based on an economic consideration of the problem. That is, the initial cost must be such that the savings in operation will show a good return on the investment. The type of stoker equipment installed on the C. F. RICHARDSON will cost about $3.75 per boiler horsepower.

Practical experience in actual operation under service conditions is the most conclusive test for any type of equipment. Charles F. Richardson, president of the company which owns the towboat by that name, has carefully observed the operation of the stokers over a long period of time and in a letter to the author he tells the whole story in a few words, as follows:

"Before stokers were applied, the average revolutions per minute of the wheel, which is 29 feet long and 29 feet in diameter, was ten. After stokers were applied the average revolutions per minute of the wheel was 12. We were able to obtain this increase due to carrying a uniform steam pressure. This is on upstream towing where maximum power is necessary. We got approximately 20 per cent greater efficiency out of the boat after the stokers were applied than we did before and in addition to that we are always confident of having maximum steam pressure when required. Before the stokers were applied this factor was always uncertain because of the condition of the fire due to hand firing.

"Before stokers were applied we had to use mine run of coal; after stokers were applied 1¼-inch screenings were used, but our records show approximately a 20 per cent increase in fuel consumption using the screenings over that using mine run of coal. On the other hand, the difference in price between screenings and mine run of coal a little more than makes up for the increased consumption. When it is taken into consideration that 20 per cent more power is developed with the stoker installation than without it, there is no question about the benefit obtained from installing the stokers.

"Another factor, which it is difficult to define accurately but nevertheless actually exists, is that before the stokers were applied it was not possible to load the boat on upstream towing to the same capacity which it has been possible to do since the stokers were applied. For instance, before applying the stokers

(*Continued on Page* 68)

What the British Are Doing

THE outstanding feature of the British shipbuilding industry is the increase in the tonnage under construction, although this is offset by the fact that keels are not being laid down as frequently as vessels are being completed, so that activity must of necessity slow down in the near future. The more optimistic among shipbuilders place their reliance on the expectation of additional contracts being obtained when harvest prospects are known and also in the government's derating scheme which should enable builders to submit lower tenders than are possible at present.

* * *

ORDERS for 18 large passenger and cargo ships have been placed with Scottish firms by the Cia de Nav. Lloyd Brasileiro of Rio de Janeiro. These awards have been divided between Scotts' Shipbuilding & Engineering Co. Ltd., of Greenock and the Burntisland Shipbuilding Co. and the 18 vessels will represent an expenditure of about $9,720,000.

* * *

THE ATHELCROWN, largest vessel ever launched from the River Tees, left the stocks of the Furness Shipbuilding Co. at Haverton Hill recently. The ATHELCROWN is a 16,000-ton twin screw motor tanker built to the order of the United Molasses Co. Ltd. for their Java service. The Furness Shipbuilding Co. already hold the record for the largest vessels built on the Tees by the recent construction of three 15,000-ton vessels for the Gulf Refining Co., and a 15,600-ton ship for the Imperial Oil Co. Ltd. These are, however, surpassed by the ATHELCROWN, which has a total deadweight greater by 400 tons than the latter. The vessel launched has also the distinction of being the largest and fastest in the rapidly enlarging fleet of the molasses company who have recently placed an order for a sixth vessel of about 13,000 tons with the Furness Shipbuilding Co. The ship is 546 feet 9 inches long with a beam of 68 feet 10 inches. The oil or molasses cargo is carried in 11 separate pairs of tanks specially designed to give good distribution of cargo. A large searchlight of about 16,000 candle power is fitted for use in the Suez canal. The engines which are situated aft are being supplied by John G. Kincaid & Co. Ltd. of Greenock and consist of two sets of diesel engines each having eight cylinders which develop over 5000 indicated horsepower. A complete oil burning installation has been fitted.

* * *

THE total launchings of April for Scotland consisted of 30 vessels of 46,914 tons, the bulk of which concerned Clyde shipyards. So far the Clyde total for the year is ahead of last year by five vessels and 763

tons and of 1927 by 16 vessels and 114,103 tons but is behind the maximum for the period by 12 vessels and 45,470 tons.

* * *

THE oil tank motor ship IRANIA which has completed its trials on the Clyde is notable as the first vessel to be propelled by an internal combustion engine wholly designed and manufactured in Great Britain. She is of 2250 tons gross and was launched in November last by the Blythwood Shipbuilding Co. Ltd., Scotstoun, for the Iranian Tanker Co. Ltd., London.

Richardsons Westgarth & Co. Ltd., Hartlepool have designed the machinery consisting of an engine of the double acting, twostroke type having three cylinders instead of the six of the normal marine diesel. It is claimed that the engine is 60 per cent less in weight than a normal marine engine of similar power, that it is equal ton for ton in price, and that being also 60 per cent of the size of an ordinary marine motor it allows of the use of more space for cargo. At full power the engine developed 1150 brake horsepower and at 91 revolutions and gave the vessel a speed of just over 11 knots.

Ocean Freight Rates

Per 100 Pounds Unless Otherwise Stated

Quotations Corrected to May 18, 1929 on Future Loadings

NOTE: FREIGHT RATES STEADY WITH SLIGHT CHANGE

New York to	Grain	Provisions	Cotton (H. D.)	Flour	General cargo cu. ft.	General cargo 180 lbs.	††Finished steel	REMARKS Freight Offered
Liverpool	1s 9d	$0.65	$0.40	0.18	$0.50	$0.90	$8.00T***	Fair
London	2s 0d	0.65	0.40	0.18	0.50	0.90	8.00T***	Fair
Oslo	$0.13	0.45	0.50	0.30	0.42½	0.85	8.00T	Very poor
Copenhagen	0.13	0.45	0.50	0.30	0.45	0.90	8.00T	Very poor
xHamburg	0.11	0.35	0.45	0.19	0.50	0.90	10.00T	Fair
Bremen	0.12	0.45	0.45	0.19	0.50	0.90	10.00T	Fair
Rotterdam and Amsterdam	0.11	0.42½	0.45	0.21	0.45	0.80	9.50T	Good
Antwerp	0.10	....	0.45	0.20	0.45	0.80	9.50T	Fair
Havre	0.13	0.55	0.31	0.30	0.45	0.80	9.00T	Very good
Bordeaux	0.13	0.55	0.31	0.30	0.45	0.80	9.00T	Very good
Barcelona	....	0.50	0.30	10.00 bags	—12.00T—		10.00T	Fair
Lisbon	....	0.65	0.45	8.00T bags	—23.00T—		8.00T	Fair
Marseilles	....	0.65	0.40	7.00 bags	—23.00T—		8.00T	Fair
Genoa	0.16	14.25T	0.50	9.00	—23.00T—		11.50T	Fair
Naples	0.16	14.25T	0.50	9.00	—23.00T—		11 50T	Fair
Constantinople	0.27	20.00T	0.75	0.40½	—24.00T—		11.50T	Fair
Alexandria	....	20.00T	0.75	0.40½	—24.00T—		11.50T	Fair
Algiers	....	0.75	0.60	8.0T bags	—23.00T—		11.50T	Fair
***Dakar	....	20.40	....	18.60T	—27.60T—		13.80T	Fair
Capetown	....	18.00	....	13.00 per 2240 lbs.	20.00		20.00	Good
Buenos Aires	....	22.00T	....	....	20.00 to 22.00T†		8.00 to 8.80T	Very good
**Rio de Janeiro	....	22.00T	....	....	20.00 to 22.00T†		7.00 to 7.70T†	Very good
Pernambuco	....	22.00T	....	9.00T	—22.00T—†		9.70T†	Very good
Havana	0.30*	0.50	....	0.30*	0.61	1.33	10.00	Fair
Vera Cruz	0.35	0.40	0.50	0.35	x		0.25 to 0.35	Fair
Valparaiso	....	1.07	....	0.70	....	....	10.00T	Fair
San Francisco	....	0.45 to 0.90	....	0.40 to 1.10	....	....	0.25 to 0.30	Very good
*Sydney	....	20.00	1.25	20.00	17.50 to 25.20		9.00 and 12.00	Fair
(x) Calcutta	....	....	0.60	....	—18.00T—		10.00T	Fair

T—Ton. ‡Per quarter of 480 lbs. †Landed. ††Heavy products limited in length. *Extra charge for wharfage.
**Plus $0.50 surcharge on all rates to Rio de Janeiro on account of congestion. ***Plus 15 per cent.
xNo general cargo rates to Vera Cruz.
*Flour to Sydney—$22.50. General cargo—$17.50 to $27.50 Finished steel—$9.50 and 12.50.

***Rates, effective at once, to Dakar, will be based on whether the company makes a contract. Rates without a contract will be about 20 percent higher. With a contract the same rates as last month apply. The figures are the rates which the company will have to pay which does not make a contract with the Daniel Bacon line to use it exclusively.

xHamburg—provisions 30 cents through April and 35 cents for balance of year.

(x) General cargo to Calcutta is $18 up to June 30. After June 30 it will be $20

From North Pacific Ports to	Lumbe Per m. t.
San Francisco	$4.25 to 4 50
South California	4.00 to 5.00
Hawaiian Islands	9.00 to 10.00
New Zealand	15.00 to 18.00
Sydney	12.00 to 13.50
Melbourne-Adelaide	12.50 to 14.00
Peru-Chile	13.00 to 14.00
South Africa	17.00 to 20.00
Cuba	14.00 to 16.00
United Kingdom	57s 6d to 65s
Baltimore-Boston range	$13.50 to 14.00
Florida Range	17.00
Buenos Aires	15.00
South America — East Coast	15.00 to 20.00
South America — West Coast	13.00 to 14.00
China	9 00 to 10.00
Japan	7.50 to 8.50
Japan (logs)	12.00 to 14.00

Flour and Wheat

U. K. and Continent (gross tons)	25s to 27s 6d
Oriental Ports (net tons)	$4.00 to 5.50

NOTE: Lighterage rates on fuel in New York reduced from 6½ to 5½c per barrel. The coal strike in Britain is now settled and freight rates or bunker prices for coal or pig iron are again quoted.

General cargo rates to Havana change daily and are omitted for the time being.

Rates to Calcutta are subject to change without notice. Cotton goes only to Bombay. Landing charge of $2.00 per freight ton at Valparaiso.

Principal Rates To and From United Kingdom

	s	d		s	d
Grain, River Plate to United Kingdom	24	0	Pig iron, United Kingdom to New York or Philadelphia	13	0
Coal, South Wales to Near East	11	9	Iron ore, Bilbao to Cardiff	6	3
Coal, United Kingdom to Buenos Aires	12	3	Iron ore, Huelva to Phila. or Balto	11	9
Manganese Ore, Poti to Philadelphia	$3.85				

Bunker Prices

At New York

	Coal alongside per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
July 18, 1928	5.00@5.60	1.10	4.92
Aug. 18	5.00@5.60	1.10	4.92
Sept. 18	5.65	1.10	4.92
Oct. 18	5.65	1.10	4.92
Nov. 20	5.00@5.65	1.10	4.92
Dec 18	5.00@5.65	1.10	4.92
Jan. 18	5.00@5.65	1.10	4.92
Feb. 18	5.00@5.65	1.10	4.92
March 18	5.00@5.50	1.10	4.92
April 18	5.00@5.50	1.10	4.92
May 18, 1929	4.00@5.50	1.10	4.92

At Philadelphia

	Coal trim. in bunk per ton	Fuel oil alongside per barrel	Diesel Eng. oil alongside per gallon
July 18, 1928	5.00@5.60	1.10	4.88
Aug. 18	5.00@5.60	1.10	4.88
Sept. 18	5.65	1.00	4.88
Oct. 18	5.65	.95@1.00	4.88
Nov. 20	5.65	.95	4.88
Dec. 18	5.00@5.65	1.05	4.88
Jan. 18	5.00@5.65	1.05	4.88
Feb. 18	5.00@5.65	1.05	4.88
March 18	5.00@5.50	....	4.88
April 18	5.00@5.50	1.05@1.10	5.12
May 18, 1929	5.00@5.50	1.05@1.10	5.12

Other Ports

Boston, coal, per ton	$6.89
Boston, oil, f. a. s., per barrel	1.06
Hampton Roads, coal, per ton, f.o.b., piers	$4.10 to 4.25
May 7 — Cardiff, coal, per ton	14s 3d
London, coal, per ton	—s —d
Antwerp, coal, per ton	21s 0d
Antwerp, Fuel oil, per ton	80s0d
Antwerp, Diesel oil, per ton	87s 6d
British ports, Fuel oil	67s 6d
British ports, Diesel oil	82s 6d



Cut Handling Costs by Practical Use of Labor Saving Methods

By R. L. Lockwood

DURING a recent discussion of a proposed new museum, Lorado Taft, the famous sculptor, urged the adoption of a new plan for arranging the exhibits in chronological order. His idea was that the visitor could then start at one end and see exhibits dating from the earliest times in all countries, pass along through exhibits showing successive developments during the whole course of history, and finally reach the modern exhibits, showing present conditions.

No such museum exists in this country. In fact an investigator interested in tracing the historical development of most industrial and commercial arts would have difficulty in finding any "exhibits" which showed early methods and practices. There are, however, a few fields in which such exhibits could be found, and one of them is the field of cargo handling. A relatively short journey, not exceeding two or three hundred miles all told, would enable an investigator to see cargo handling methods dating all the way from 1000 B. C. to 1929 A. D.

Cargo Handling an Old Trade

Men have been loading and unloading ships for three thousand years and more. Almost all of the kinds of goods carried in ships three thousand years ago are still carried in ships, but hundreds and thousands of new kinds of items have been added to the old ones. Handling methods, too, have changed, but the changes in methods have by no means kept pace with the changes in kind and quantity of cargo. The most striking changes in methods and equipment have been made in handling bulk cargoes such as coal, ore, and grain. A large proportion of such materials cost little or nothing in their original state and place. Their final cost to the user is little more than the summation of the costs of handling them. Any reduction in such costs has an immediate effect on selling price.

Handling Costs Since War

For this reason, there was a strong incentive for the development of special machinery for handling bulk materials, and such machinery caused a revolution in methods and costs. During the period from 1890 to 1910, for example, the cost of unloading iron ore from ships on the Great Lakes was reduced from one dollar a ton to less than one cent a ton. Similar savings were made in the cost of loading and unloading cargoes of coal, grain, sand, and other bulk materials. The vast field of miscellaneous cargo, however, offered a less obvious incentive for the development of new methods and new equipment. Until recently, the value per ton of miscellaneous freight, and the amount of freight charges, loomed so large that the less apparent costs of handling, loading and unloading were comparatively neglected.

Only during and since the World war has there been any general widespread interest in analyzing such costs in an effort to reduce them. During the past ten years, however, new machines and devices for handling ma-

Analyze Your Problems

EVERY shipping executive faced with the daily problem of keeping expenses from eating up the profits should read Mr. Lockwood's article. Before we can accomplish things we must have the vision of something better. In this article Mr. Lockwood points to the day when many practices now current in handling cargo to and from ships will seem as archaic as do the methods used in building the pyramids when compared to those used in erecting a New York skyscraper of today. Industrial America leads the world in mechanical efficiency. In the same manner the impetus of clear unprejudiced thinking, untrammeled by years of static tradition will lead to better methods for loading and unloading ships; methods that will show an improvement in every phase of cargo handling. Expense will be reduced, safety will be increased and men themselves will be saved from the hardest kind of physical labor.

Progress must be initiated from above. Why shouldn't every operation be studied with a critical eye to its efficiency? Let intelligence reign rather than blind custom and tradition frozen into solid prejudice.

terials and goods have developed rapidly, and have revolutionized handling methods in factories, construction jobs, and railway freight terminals. A large proportion of the articles handled by this new equipment are articles that must also be transported by water, or that could be so transported if they could be economically handled on steamship piers and in and out of ships.

Some steamship companies have long realized the possibilities for speeding up cargo handling and reducing the cost per ton handled, by taking advantage of the new developments in methods and equipment. While the experience of railroads in freight handling has in some cases been valuable in handling cargo, very little of the experience of factories is applicable, by reason of the enormous diversity encountered by every steamship company which handles mixed cargoes. Loading and unloading miscellaneous freight can never be organized and "integrated" like the multifarious operations carried on in a manufacturing plant, but nevertheless there are numerous operations which do recur with some regularity, and to which mechanical equipment can be successfully applied.

In analyzing such operations, we find that they range all the way from the primitive methods of handling goods by main strength, supplemented only by bale hooks, crowbars, and rollers, up through the whole category of hand and power trucks, to the expensive crane, monorail, and other specialized apparatus used on the most modern docks and piers. In many places practically the entire range of operations may be seen. Almost everywhere we can see some, if not all, of the primitive methods, plus a greater or less range of more modern methods and equipment.

Should Study the Equipment

When we undertake to study the equipment itself, we find at one end of the operation the usual types of cargo booms and winches on ships, and at the other, the equipment used to get cargo from trucks or railway cars to the pier floor. For the purposes of this discussion we may leave out of consideration both ships' tackle, and primitive tools such as bale hooks, crowbars, rollers, and two wheeled hand trucks. In between these two groups come numerous kinds of equipment, mostly designed for mechanically handling goods. These include three, four and six wheel trucks, lift trucks, stackers, tractors, trailers, floor cranes, overhead and monorail cranes, and large bridge or gantry cranes. Each of these types of equipment is used not only on piers and docks, but in factories, warehouses, and railway freight terminals as well. Consequently the functions and capacities of such equipment are well understood, and records are easily available to show their performance, and the work to which they are best adapted.

In selecting equipment, however, this "experience record" is seldom utilized as well as it could be. One obvious reason is that handling mixed cargo is a wholly different proposition from handling goods in a factory or in the average warehouses. It is even more diversified than handling freight in and out of railroad cars, cars are at least more or less standardized, while ships are not. In spite of these differences, however, practically every operation involved in loading and unloading ships may also be found in one or more of the other establishments mentioned, and can be studied in detail as to equipment performance.

Such study will disclose surprising differences in cost per ton of goods handled, due to the enormous variety in kind of goods handled, and in operating conditions, even for equipment identical in size and capacity. In almost every instance, however, a given piece of equipment has some one kind of goods and one set of conditions which permit maximum economy and performance. Many industrial and railway establishments, which show amazing records of low unit costs of handling, have done so by studying each kind of equipment closely, and finding the particular operating conditions under which it will produce maximum results.

In the case of expensive "fixed equipment," such as large overhead or gantry cranes, or monorails, it is usual to find that a careful study has been made to determine maximum performance. Goods to be handled, "load factors," (meaning percentage of



The Old Way—A Method in Use Since the Wheel Was Discovered—Still Necessary in Some Cases

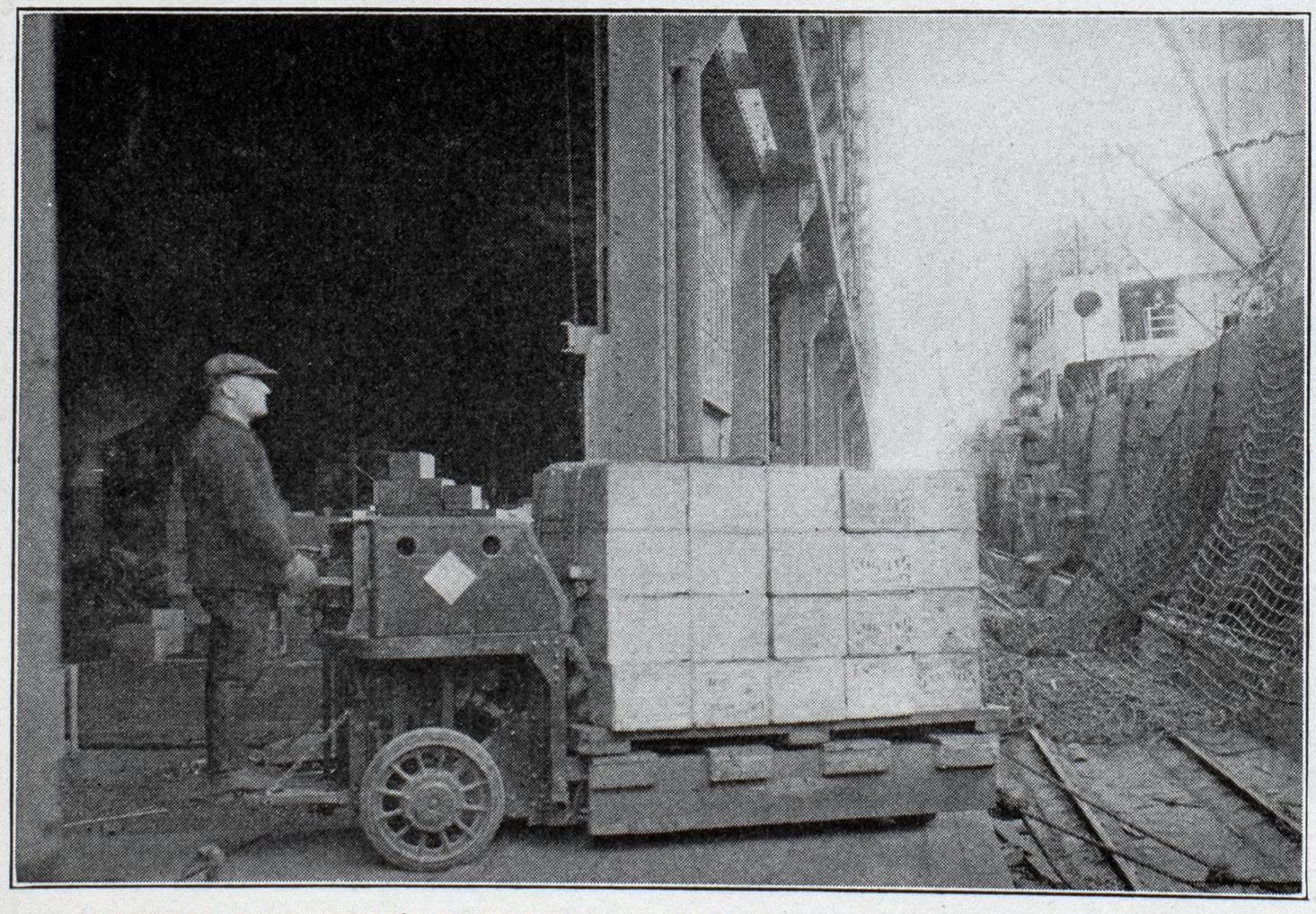


The New Way—Tractor Pulling Train of Trailers Loaded with Sugar, at Pinners Point, Va.

time in actual use,) operating costs, and operating conditions, are all carefully analyzed in advance, and an accurate estimate made of cost per ton of goods handled, including all factors entering into cost. Such factors include operating cost, depreciation, interest, and all "overhead" costs, distributed over the estimated average quantity of goods to be handled. First cost is often unimportant. A company will gladly spend half a million dollars for equipment that will handle goods for five cents a ton, in preference to buying equipment costing half as much but which will handle goods for ten cents a ton, provided the tonnage is there to be handled.

Determine True Performance Value

This is "buying performance," as contrasted to simply buying so many pounds or tons of metal made up into handling equipment. But when we come to the more numerous and highly diversified kinds of equipment ordinarily known as "floor equipment," or "mobile equipment," we find that too often the purchase is made with little regard for true performance value. One reason is that performance value is not easy to calculate, but requires close study not only of conditions under which it will be used, but of the performance of similar equipment in other fields of industry and commerce. Another reason is that the first cost per unit of such equipment is much smaller than the cost of the larger kinds of equipment above mentioned, and therefore less carefully studied in relation to performance than is that of a large gantry crane, for example.



ELECTRIC LIFT TRUCK HANDLING CANNED GOODS ON PACIFIC COAST DOCK

It is a surprising fact, however, that in the case of the majority of floor equipment, first cost is saved in a far shorter time than in the case of the larger machines. It is no uncommon thing for a lift truck or a tractor or floor crane to save its entire cost in a few months. Many records show that a certain piece of equipment, such as a power operated lift truck, has saved its cost in eight or ten weeks, whereas a large overhead crane, for example, may be considered a good "buy" if it saves its cost in two years. In view of these proved facts, a study of "performance buying" is much more important, proportionately, in connection with floor equipment than with the larger and more expensive machines.

Minimum Cost Per Ton

Buying performance has long been recognized as an essential policy in many fields. The late A. M. Wellington, author of "The Economic Theory of Railway Location," brought this out very forcefully in regard to rails, as follows:

"In buying rails we are not buying steel; at least we do not care to buy it. We are buying three imponderable qualities: (1) stiffness; (2) strength; (3) durability. If we get our money's worth of these qualities, it is a matter of complete indifference (except for the future scrap value of the steel, which a poor, light-traffic road cannot give much thought to) whether we get much or little of steel. If we do not get our money's worth of what we want, our bargain is just as bad no matter how much steel we get."

Buying performance in a piece of mechanical equipment is less simple

than in steel rails, for there are more factors to consider, but the underlying principles are exactly the same. The essential qualities to be bought must be first determined, measured as accurately as possible, and balanced one with another. The end to be sought is of course minimum cost per ton of freight handled, taking all costs into consideration. The first steps must consist in studying the kind and tonnage of goods to be handled, followed by a study of the kinds of equipment used to handle such goods under various operating conditions in other places, and the unit cost in each. One source of such information may be found in the records of equipment manufacturers, all of whom are ready to furnish data as to the performance of their equipment, which can be checked up by an inspection of the actual operations cited. Users of such equipment are usually very willing to give information regarding performance in their own plants.

Practical Application Is Essential

When the prospective buyer has secured as much information of this sort as possible, he can then study its application to his own particular operations. Two principal factors will then appear at once. The first is the question of load factor mentioned above. Unless a piece of mechanical equipment can be kept busy during a fairly large percentage of the time, it will not pay to buy it. But load factors are by no means uniform or fixed, nor is the profitable load factor the same for different kinds of equipment. For example, it might pay to buy a stacker or tiering machine even if it were to be used only two per cent of the time; on the other hand, different conditions might require a load factor of ten or twenty per cent to make the purchase of a machine a profitable investment. It is usually, however, a fairly simple problem in arithmetic to figure this out in the case of each machine under consideration.

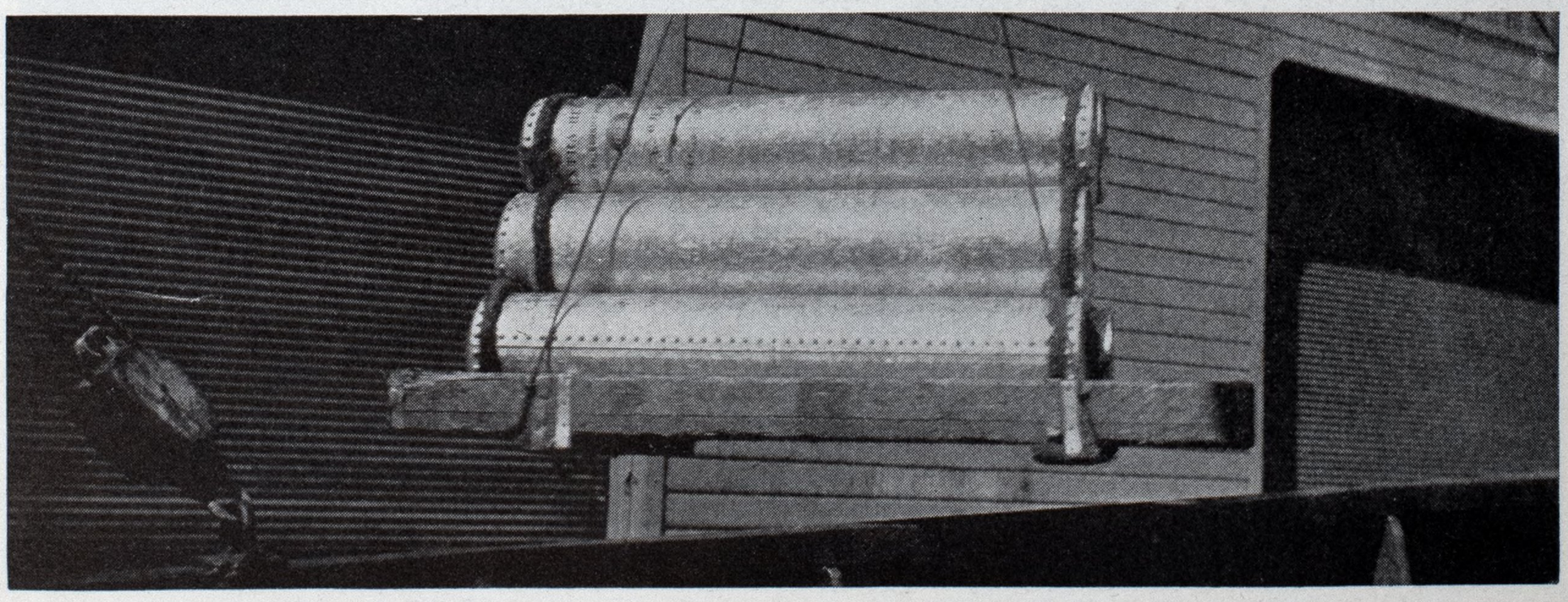


POWERFUL GASOLINE TRACTOR USED FOR TOWING TRAILERS AT TERMINAL

The second factor is more complex, and less easy to figure out, but is often of equal or greater importance. It consists in determining proper working conditions for the equipment. It may be impossible to provide ideal conditions for each of many different kinds of equipment, but the buyer should know what the ideal conditions are for each kind, in order to reach the best possible combination which his particular situation will permit. One of the most important factors in operating floor equipment is the floor surface itself. Most piers are far from ideal in this respect, and perhaps can never be made wholly so. But a study of the effect of rough or irregular floors on equipment performance will at least clarify the problem.

Floors Must Be Good

Trucks, tractors, trailers and all other wheeled vehicles, whether hand or power operated, depend largely upon smooth floors for maximum performance. The amount of time, labor, and power lost by trying to operate equipment on bad floors may be several times the amount put into useful work. A recent test of a loaded lift truck showed that it took 50 pounds pull to start it on a smooth concrete floor. With ordinary wooden match-sticks in front of the rear



Dents in Range Boliers Have Been Avoided by Using Platform Slings and by Having Manufacturers Rope Ends of Boilers as Shown in This Illustration

wheels, the starting pull was 100 pounds. With pieces of one-eighth inch wire in front of the wheels, it took 350 pounds to start the truck! Compare the size of that wire with the humps and hollows of the average plank floor in a pier shed!

One of the largest railroad freight stations in the world has been equipped with a hard maple top floor, as smooth and level as a bowling alley. Some 1500 tractor-drawn trailers are used, and the increased speed and capacity made possible by the smooth floor considerably more than compensates for the cost of installing and maintaining the floor. Another railroad establishment, where lift trucks and skid platforms are extensively used, has been equipped with concrete platforms replacing wooden ones, and ramp pitches have been reduced by lengthening ramps wherever possible. Expensive as this improvement has been, the railroad will save its cost within little more than a year, and will thereafter enjoy a greatly reduced cost per ton of materials handled.

Good Lighting Increases Efficiency

The importance of adequate lighting is frequently underrated. Large warehouses, industrial shipping rooms, and railway freight houses, baggage rooms, and terminals, are being studied today as were offices and drafting rooms a few years ago, with similar results in increased efficiency of workers. Some establishments have also found it possible to heat sheds and similar structures, saving the cost many times over in increased performance. More and more shipping and loading platforms, formerly open, are being roofed over. Complaints are often heard about the modern tendency to "Coddle" the workers, but the most casual investigation will show that those establishments which have gone farthest in providing comfortable working conditions are the ones which show the greatest output per worker.

Careful investigation and study of the possibilities for providing the best available working conditions, both for equipment and for men, will invariably disclose ample opportunity to provide both to a degree seldom appreciated without such study. When those in charge have determined the kind of equipment to be used, and the extent to which proper working conditions can be provided, the next step is to select the particular make and size of equipment which will produce the best results, measured by unit cost of handling freight. At this point the question of performance specifications becomes of first importance. First cost can never be ignored, but it is only one of several equally important factors.

Buying performance not only requires full knowledge of what can

(*Continued on Page* 70)

How to Safely Stow and Handle Cargo

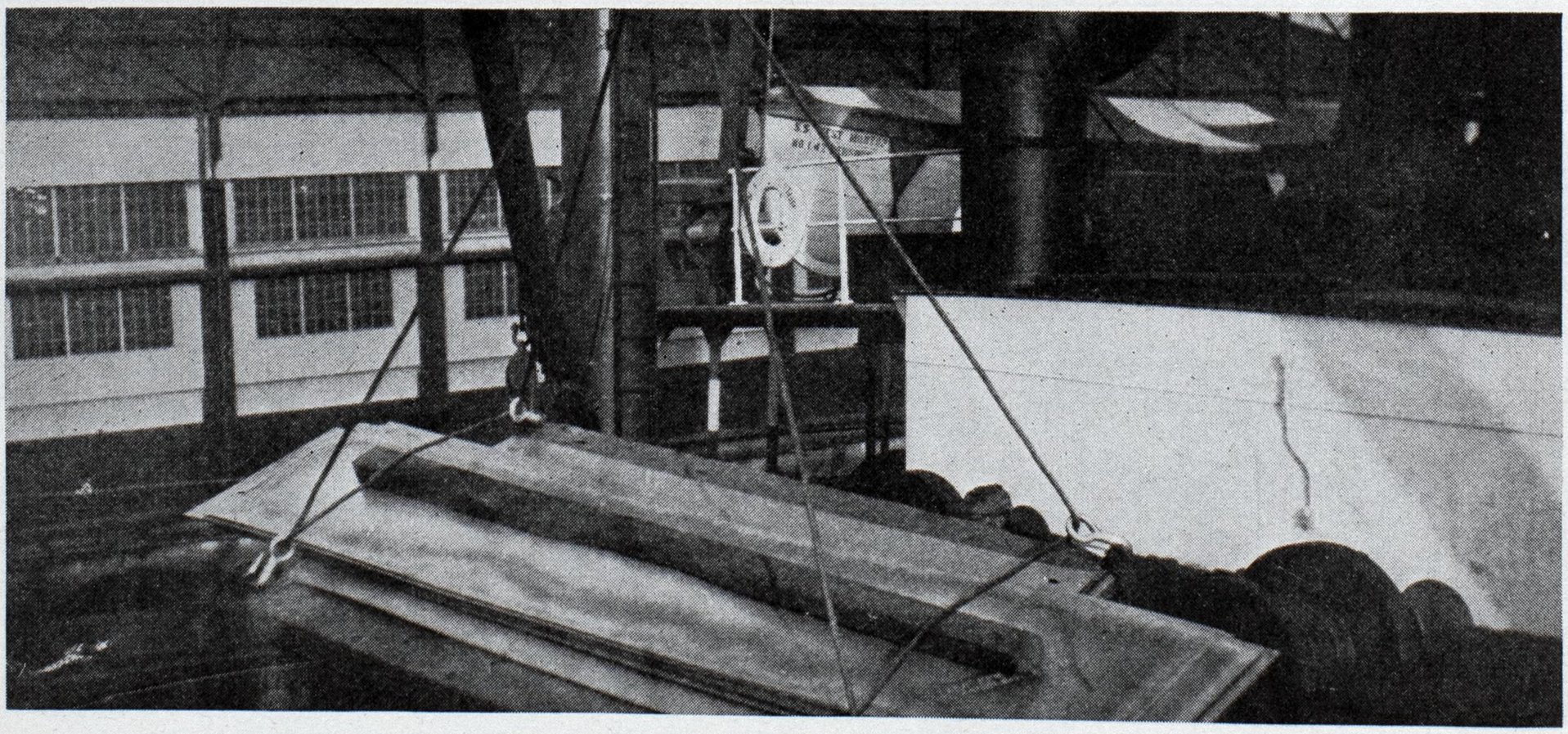
THE Hammond line prevents the formation of rust on sheet steel by spreading a tarpaulin over the pile of sheets after stowing in the hold. Previous method was to divide a pile into several sections with pieces of lumber to permit ventilation, this method, however, failed to give satisfactory results.

Damage to the sheets caused by falling from the sling has been prevented by the use of a platform sling as shown in the illustration.

Some companies are experimenting with shipping sheet steel in units of two or three tons covered with waterproof paper and strapped together with steel bands. This results in preventing rust and practically eliminates damage to the edge of the sheets. This method was successfully tried out last winter by an automobile company in Detroit. The sheet steel was handled in gondola cars without any damage, although exposed to severe winter weather.

Formation of rust caused by sweating in ship's hold is reduced by following the practice of the canners and some shipping lines who store the cases so that the cans are on their sides. This prevents water from accumulating in the depression at the top of the can.

Denting of cans is avoided by placing the end cases in the top rows on a platform sling in such a position that the pressure of the spreader is thrown on the top or on the bottom of the cans rather than on the sides. This puts the pressure against the can in the direction of its strength.



Platform Sling for Sheets Arranged to Prevent Sliding Out When Lifted, Causing Damage

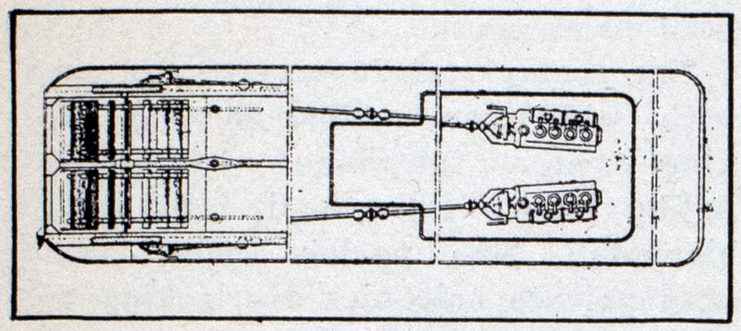
Patents Show Marine Development

Latest Marine Inventions Described

Specially Prepared for Marine Review
By Richards and Geier

Patent Attorneys, 274 Madison Avenue, New York

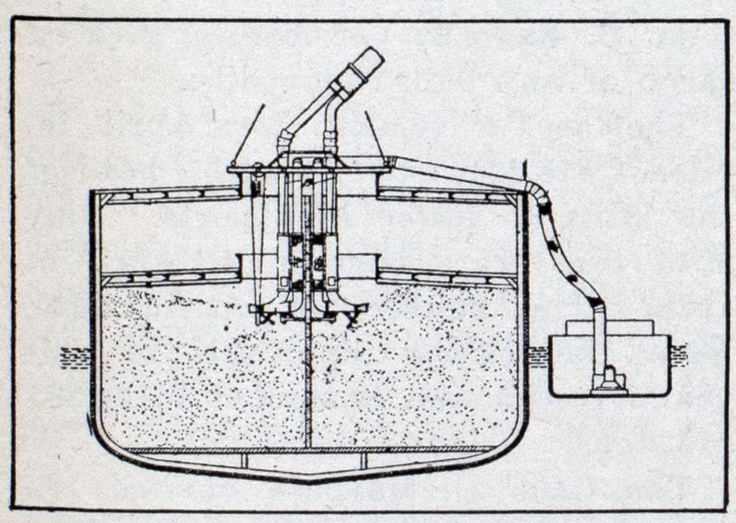
THIS invention relates to paddle wheel boat drives, and particularly to drives for boats employing a plurality of paddle wheels.



PADDLE-WHEEL-BOAT DRIVE

U. S. Patent No. 1,707,629, issued April 2, 1929 to Francis R. Dravo, of Pittsburgh, assignor to Dravo Contracting Co., of Pittsburgh.

THIS invention relates to an apparatus and method for loading loose bulk cargoes such as coal, grain, nuts, etc., and has for its primary object to provide a simple and efficient method for trimming the cargo so that the hold of the vessel will be filled to its full capacity.

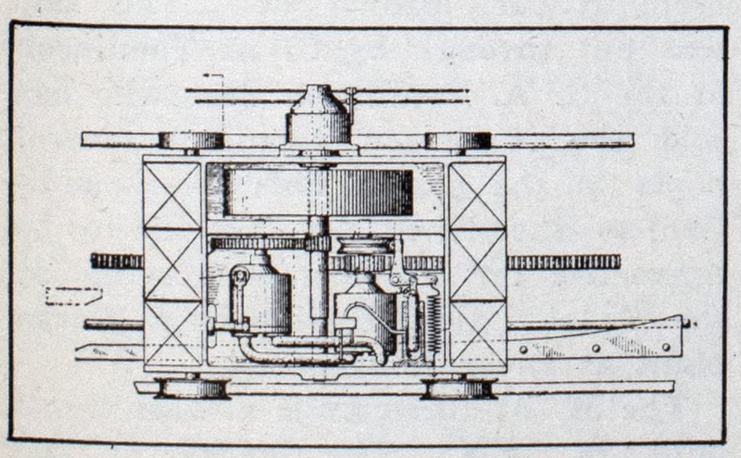


FOR LOADING LOOSE-BULK CARGOES

U. S. Patent No. 1,708,176, issued April 9, 1929 to Ludwig F. Holly, of Madison, N. J., assignor to Holly Pneumatic Systems, Inc., of New York.

THE main result which is sought to accomplish by means of this invention is the effective control of the roll of a vesel by the use of a weight shiftable back and forth athwartship under accurately and positively controlled conditions.

As one important feature of this invention there is imparted to the active stabilizing weight simple harmonic motion athwartship and of controlled and variable amplitude in the period of the vessel's roll.

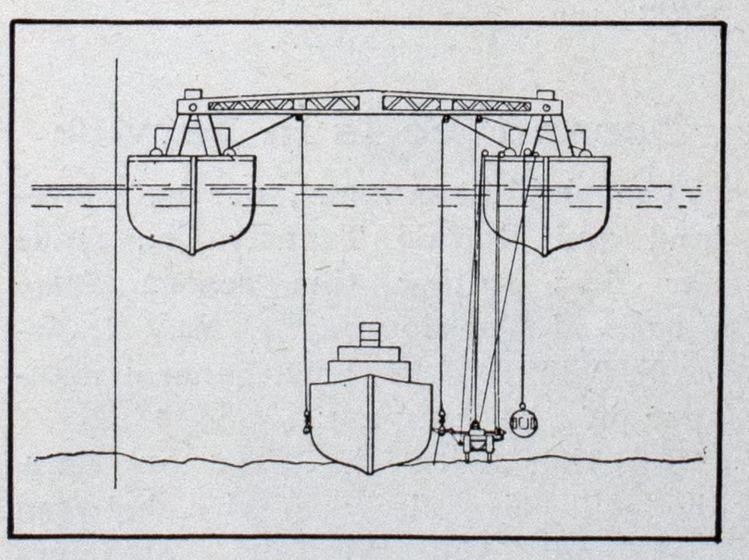


SHIP STABILIZER

U. S. Patent No. 1,708,679, issued April 9, 1929 to Carl L. Norden, of Brooklyn.

WE HAVE made arrangements with the patent attorneys Richards & Geier, to publish data relating to letters patent issued in the United States covering inventions which may be of particular interest to our readers. The patents described, some of which have accompanying cuts partially illustrating the inventions, are all of recent date and we are planning, in subsequent issues, to publish similar information on patents pertaining to various phases of marine development work. Should our readers be interested in obtaining a printed copy of any of the patents appearing in this issue, or any other patent desired, such copies may be had by addressing request to the editor or directly to the contributors of this page.

THIS present invention relates to an improved salvaging equipment for use in raising sunken or submerged ships or vessels to the water surface. In carrying out the salvaging operations for a sunken ship, after the latter has been properly located, there is utilized a pair of salvaging or rescue ships of suitable floating capacity, one located at each side of and parallel with the sunken vessel, and from the surface vessels lifting hooks and cables are lowered.

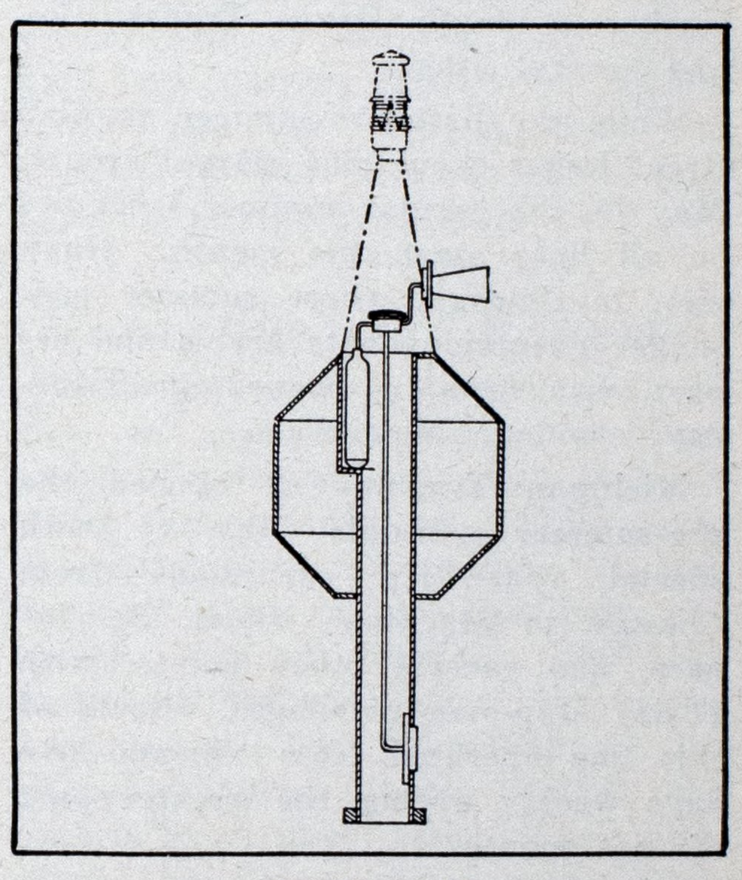


SALVAGING EQUIPMENT

U. S. Patent No. 1,710,103, issued April 23, 1929 to Nels Nelson, of Spokane.

THIS invention relates to buoys or similar signaling stations fitted with acoustical signaling apparatus.

It is the object of the invention to provide automatic overwater or submarine signals acting in a perfectly reliable manner, whereby it is avoided to employ signaling or sending apparatus which have been developed and constructed for other purposes, and signaling apparatus employed which is specifically intended for the requirements of unmanned stations.

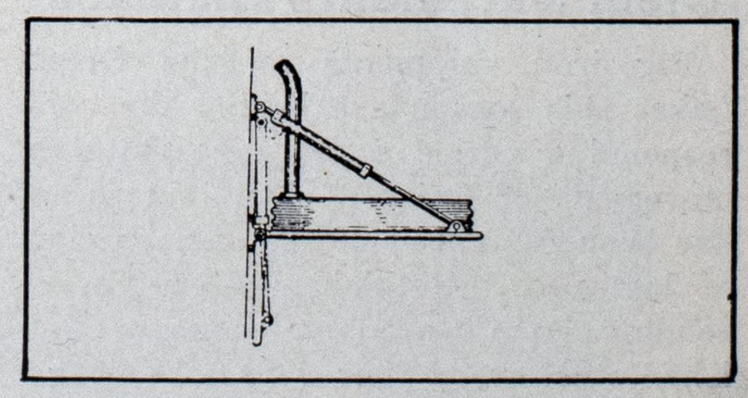


SIGNAL BUOY

U. S. Patent No. 1,709,890, issued April 23, 1929 to Ernest Wilckens, of Berlin, Germany.

THIS invention relates to a new and useful ship safety device especially adapted for the purpose of keeping a ship afloat during extreme heavy or rough seas and for the purpose of keeping a foundering ship afloat.

The object of the invention is to provide a pair of buoyant inflatable members adjustably secured to and extended from the sides of the ship and a means of inflation in combination with a means of rigidly holding the said buoyant members in a horizontally or somewhat downwardly extended position when in use.



SHIP SAFETY DEVICE

U. S. Patent No. 1,708,784, issued April 9, 1929 to Mariano Carloni, of Concord, N. Y.

Up and Down the Great Lakes

Cruises and Excursions Popular—April Lake Levels—Buffalo Service Starts—Toledo Terminal—Lighter Steamer—Grain Blockade Relieved

GREAT Lakes steamship companies report cruises and excursions growing in popularity. Steamship companies serving the lake tourist trade expect a record business this season. Great Lakes excursions from lower lake ports to Wisconsin and Michigan resorts are offered in abundance by various transportation companies, including the Goodrich Transit Co., Michigan Transit Co., Chicago, Duluth & Georgian Bay Transit Co., Detroit & Cleveland Navigation Co., Chicago, Benton Harbor & South Haven Transit Co., and several others.

While the first pre-summer regular Great Lakes excursions started around May 15, the regular summer schedules on all lines start this month. Navy pier, in Chicago, where summer passenger excursion boats arrive and depart, was formally opened on Saturday evening, May 25.

Michigan Transit Co., opened the pre-summer schedule May 15 with special round-trip excursions from Chicago to Mackinac island, St. Ignace, and several other points, with 21-day stop-over privileges. Boats of this line operated from Chicago five days weekly during the greater part of last month.

Goodrich Transit Co. added one passenger vessel to the four regular steamers plying the lakes to and from Chicago, and this month the fleet will be increased by seven more. The line will open for the summer season June 22. Chicago, Duluth & Georgian Bay Transit Co. opens the summer season June 25. Detroit & Cleveland Navigation Co. opens the regular summer excursion season June 27. The West Ports Steamship Co. lines may discontinue excursion passenger service this summer, it is stated.

Steel Shipments Increase

Pig iron shipments on the Great Lakes this season are behind the corresponding period a year ago, but the movement of finished steel and scrap has been far ahead of the same period of last year. Bethlehem Steel Co. is sending from Buffalo a cargo of finished steel every four days to Chicago and Milwaukee territory. This compares with an average of about one cargo each week last season. Shipments of pig iron are being made from Chicago to Muskegon, Mich., while four cargoes of pig iron from eastern lower lake furnaces have been shipped into the Chicago district.

April Lake Levels

The United States Lake Survey reported the monthly mean stages of the Great Lakes for the month of April as follows:

Lakes	Feet above mean sea level
Superior	602.60
Michigan-Huron	581.39
St. Clair	576.34
Erie	573.56
Ontario	247.28

Lake Superior was 0.11 foot higher than in March, and it was 0.75 foot higher than the April stage of a year ago. Lakes Michigan-Huron were 0.73 foot higher than in March, and they were 1.87 feet higher than the April stage of a year ago, 1.9 feet above the average stage of April of the last ten years. Lake Erie was 1.09 feet higher than in March and it was 1.77 feet higher than the April stage of a year ago. Lake Ontario was 1.13 feet higher than in March and it was 0.86 foot higher than the April stage of a year ago, 1.48 feet above the average stage of April of the last ten years.

Reports on May 21 stated that the steamer TEN of the Poker fleet was aground at the upper end of Middleground above the Soo. The TEN was downbound for Buffalo carrying a cargo of flour, butter and eggs. It is said that defective steering caused the accident which resulted in the puncturing of her No. 1 tank.

Seeandbee Is in Service

The ship SEEANDBEE, of the Cleveland and Buffalo Transit Co., made her first sailing this season from Cleveland Tuesday night, May 7, according to P. J. Swartz, general manager of the company.

Together with the CITY OF ERIE, she will give daily service between Cleveland and Buffalo, steamers leaving each way, every night at 9 p.m., arriving at 7:30 a.m.

The SEEANDBEE, commanded by Captain Neil J. McPhail, is the finest ship in the Seeandbee fleet and is a boat of luxurious comfort. She is 500 feet long, 100 feet wide and has 500 staterooms and 24 parlors providing sleeping rooms for more than 1500 passengers.

The roomy staterooms are equipped with wide, comfortable berths, running water, telephone and electric lights, snowy linen and soft downy blankets. The parlor rooms, some with private balconies overlooking the water, are equipped with private baths and are beautifully furnished.

Record Ore Movement

The movement of iron ore for the month of April this year was the greatest ever experienced on the Great Lakes, according to reports of the Lake Superior Iron Ore association. Another shipping record was broken when the large self-unloader CARL D. BRADLEY carried the greatest cargo of any bulk commodity.

The ore movement for April totaled 2,516,241 tons from the head of the lakes to lower lake ports. Only 5946 tons were carried in April of 1928. The figures for April, 1925, were the closest approach to this year's record and amounted to 2,120,715 tons.

The CARL D. BRADLEY carried 18,102 net tons of stone from Cleveland to Buffington. This is the largest cargo of any description ever carried in the history of the Great Lakes.

Nicholson Buys Steamer

On May 16, the Nicholson Universal Steamship Co. of Detroit purchased the steamer M. A. BRADLEY from H. H. Brown Co. The sale was put through by G. A. Tomlinson of the G. A. Tomlinson fleet who has sold the Nicholson company several boats in the past. This latest addition to the Nicholson fleet is to be converted for automobile-carrying at the Great Lakes Engineering Works plant at River Rouge.

The M. A. BRADLEY is a steel vessel built in 1908. The length of the boat is 460 feet and the beam 52 feet. Depth is 30 feet. The pur-

chase of this boat makes the Nicholson company probably the largest carrier of automobiles on the Lakes.

Record Coal Cargo

When the vessel HARRY COULBY cleared Ashtabula for Indiana harbor May 14, she carried a cargo which broke the second record of the season in Great Lakes shipping. The cargo of the COULBY was 15,628 net tons of coal, the largest in the coal carrying trade ever loaded on the Great Lakes. It was estimated that the boat could have carried 16,000 net tons of another quality of coal.

The former record cargo in this trade was held by the steamer D. N. KERR of the Pittsburgh Steamship Co. which took on 15,532 net tons at Conneaut in 1919. Last year the HARRY COULBY carried 14,240 gross tons of iron ore from the head of the lakes to a Lake Erie port. This was the largest iron ore cargo ever carried. The greater draft of this season is undoubtedly the cause of the record-breaking cargoes this year.

To Build Toledo Terminal

Construction of the $6,000,000 rail terminal at Presque Isle was made certain on May 10 following announcement that contract for two miles of dredging which includes four slips, fills and docks for coal and ore loading machinery had been awarded to the Great Lakes Dredge & Dock Co., Cleveland. According to the contract, an expenditure of $1,750,000 of the $6,000,000 and more is to be spent in the first portion of the work. Dredging is to be along the two-mile frontage of property on the shore of the east bay south into Otter creek and also in the dredging required for the building of docks in the slips 1200 to 2000 feet long.

The Hocking Valley railroad from whose offices reports of the contract award came, is to do its own yard building which will call for an expenditure of more than $700,000. It is expected that about six months will be required for the dredging and work on the dock, after completion of which the machinery will be ready for installation. Officials estimate that the new terminal will be completed for the beginning of the navigation season of 1930.

Steamer Is Lightered

An airway beacon mistaken for a harbor light was responsible for the grounding of the steamer D. M. PHILBIN, 1000 feet off Kings Cove on Lake Erie, April 30. The pilot of the boat mistook the air beacon at North Kingsville for the Conneaut lighthouse and headed the steamer straight for shore with a 9500-ton cargo of iron ore. One of the forward ballast tanks was punctured and the boat was aground in 16 feet of water. The vessel's draft when loaded is about 20 feet. The boat was near enough to shore so that the crew could easily get out of danger in case of necessity.

Work of lightering the boat was begun May 1 when the lighter RELIANCE and the tug HARDING of the Great Lakes Towing Co. arrived from Detroit. Thirty-five hundred of her 9500-ton cargo were lightered before the PHILBIN could be pulled off the rocks. After unloading her cargo at Conneaut, the vessel was taken to the yard of the American Ship Building Co. at Lorain for repairs.

Add Three Boats to Fleet

According to statistics released by the M. A. Hanna Co., April 22, eight freighters and one barge were taken away from the iron ore carrying trade during last year. These boats had an aggregate trip capacity of 53,900 tons, based on a 19-foot draft. Three boats are to be added to the trade this year with a total trip capacity of 33,900 tons. They are building for Pittsburgh Steamship Co.

Having 87 boats in the iron ore trade, with an aggregate capacity per trip of 723,200 tons the Pittsburgh Steamship Co. is first in the list of companies operating in this trade. The Interlake Steamship Co. stands second with 45 ships and an aggregate trip carrying capacity of 380,000 tons. The ore carrying fleet has a total of 340 vessels with a trip capacity of 2,827,000 tons.

Grain Blockade Relieved

Reduction of two cents in the rail rate on wheat has been the direct cause of relieving the grain blockade which has exisited at Buffalo since the opening of navigation. It was reported that orders had been received for forwarding 3,000,000 bushels of the commodity. As a consequence of this alleviation of the choked condition of the Buffalo elevators, more lake vessels have been placed to bring grain down from Duluth and the Canadian head of the lakes to Buffalo.

S. S. Fernie—New Canadian Freighter

THE Midland Shipbuilding Co., Midland, Ont. recently completed the cargo steamer FERNIE *for the Canada Steamship Lines, Ltd. The vessel was built in less than three months. She is a general cargo ship of the so-called Northwest type, her size permitting her passage through the Welland canal. The dimensions of the* FERNIE *are: Length overall, 258 feet; breadth 42 feet 9 inches; depth, 26 feet; deadweight on 14 feet draft, 2400 tons.*

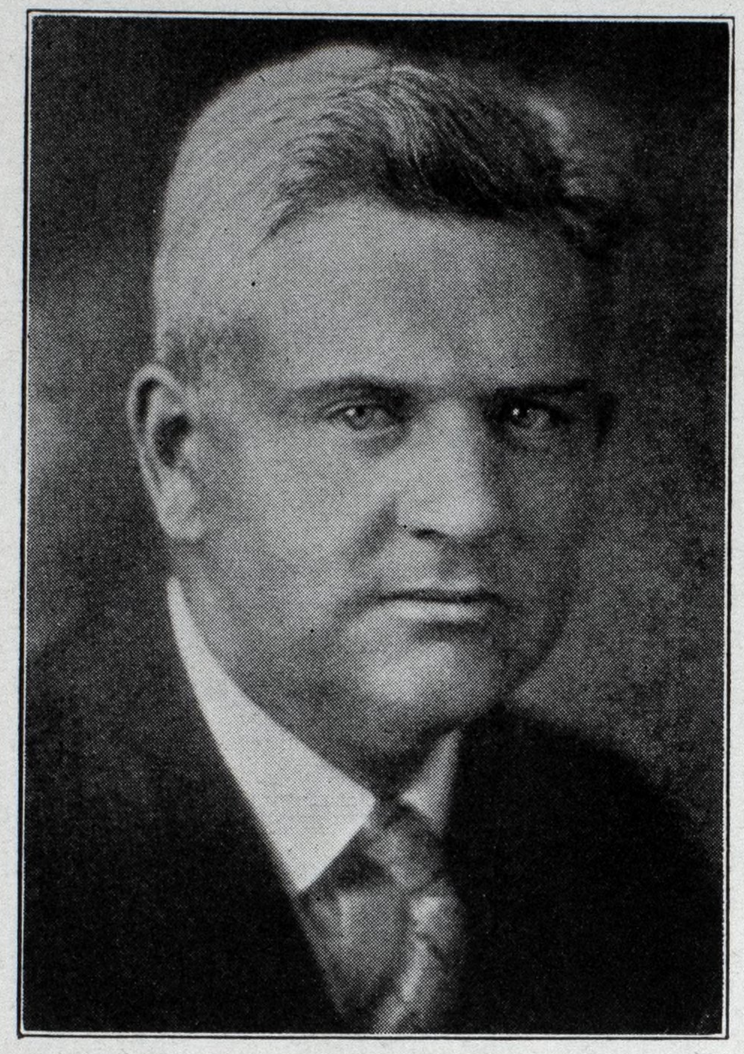
The S. S. FERNIE *is now engaged in the Montreal-Fort William package freight service under the command of Capt. Alex Wilson. J. F. Henry is chief engineer.*



Personal Sketches of Marine Men

Roger D. Lapham, President American-Hawaiian Steamship Co.

By Robert C. Hill



—Photo by Hartsook, Cal.

SHIPPING experience of a wide range over a period of exactly twenty-four years since graduating from Harvard has fitted him to deal wisely with shipping problems.

HE COMES from a maritime family and has been reared in the traditions of American shipping. He has faith in the ultimate success of the American merchant marine.

A STRONG believer in the ability of Americans to operate ships successfully, if given an even chance, he does not underestimate the strength and keenness of foreign competition.

TWENTY years after he entered the shipping business with the determination of learning it in detail from the bottom up, Roger D. Lapham was elected president of the American-Hawaiian Steamship Co., operating one of the largest fleets under the American flag. Today he is probably the youngest steamship president in the United States. His career proves that hard work and perseverance can place a man at the top in a comparatively short time.

Roger D. Lapham comes of a family long identified with the merchant marine. Love of the sea runs in the blood. He was born in an atmosphere of ships and reared among the best traditions of American shipping. He is the grandson of D. B. Dearborn, who now at the age of 97, is the oldest living member of the Maritime exchange, New York. George S. Dearborn, one of the founders and the first president of the American-Hawaiian, was his uncle. It was therefore a natural impulse that projected him into the world of shipping, but it was by sheer ability that he rose so rapidly to a position of responsibility.

The American-Hawaiian Steamship Co. has had and is having its share in creating the maritime annals of America. The original company in 1855 established a clipper ship line between New York and North Pacific ports. For years it maintained a proud position in the intercoastal trade via Cape Horn, helping to develop the sugar industry of the Hawaiian islands by furnishing transportation for the products of that rich territory.

Incorporated in 1899, the American-Hawaiian built a fleet of modern freighters replacing the windjammers which had to give way to speedier carriers. A rapidly expanding service was maintained via the Straits of Magellan. Some years before the Panama canal was completed the Cape Horn route was abandoned. The American-Hawaiian entered into a traffic agreement with the Tehuantepec railroad whereby cargo was trans-shipped across the Isthmus of Mexico between Salina Cruz and Puerto Mexico.

During the World war the American-Hawaiian played an important role in helping the Allied cause to victory. Its fine fleet was commandeered by the government and rendered valiant service in transporting troops and supplies. A number of the company's ships were lost or severely damaged by enemy submarines.

The war over, the American-Hawaiian was the first line to establish regular intercoastal service through the Panama canal. In the decade that has since passed into history, this pioneer company has increased its fleet as business warranted until now it is one of the leaders in a water service that is as dependable as that by overland railroad.

Thus at the age of 45, Mr. Lapham heads this great organization, fully alive to the needs of commerce and prepared to care for the constantly expanding flow of cargo by water from coast to coast. The fleet running between Atlantic and Pacific ports through the Panama canal now numbers 23 large modern freighters. The American-Hawaiian is also interested with the Matson

Navigation Co. in American flag tonnage serving the Orient and the Antipodes while only recently a substantial interest in the Williams line, also an intercoastal factor, was acquired. It can be seen at a glance that Mr. Lapham has faith in the American merchant marine whether operating in foreign trade or in the protected coastwise routes.

On graduation from Harvard in 1905, Mr. Lapham joined the American-Hawaiian office force in New York, remaining there in various capacities for five years. In 1910 he was transferred to the Seattle office where he was assistant agent for two years when he was promoted to the position of company agent at Los Angeles. In 1915 another promotion sent him to San Francisco as assistant traffic manager. He served here until 1917 when the American-Hawaiian fleet was called into war service by the government.

From 1917 until January, 1919, Mr. Lapham served his country overseas doing his bit in the army while the company's steamers were doing their share in carrying troops and supplies. While still overseas, Mr. Lapham was asked to go to London as shipping expert to direct the shipping department of the American Relief administration headed by Mr. Hoover. He remained in this service until late 1919 bringing to the position his years of practical experience in water transportation.

The shipping firm of McCormick, McPherson & Lapham, shipping agents, at San Francisco and Los Angeles, was organized in 1922 but the following year Mr. Lapham withdrew to become treasurer of the American-Hawaiian Steamship Co. When Carey W. Cook retired from the presidency of the latter company in 1925, Mr. Lapham was his logical successor and he has since held the position of president. His record in this office has been noteworthy in that his company has greatly expanded and improved its services.

With all the enthusiasm and energy of youth, he combines the ripe judgment of practical experience. He is a devotee of hard work, a deep student of commerce and shipping problems. He strongly supports every practical plan for the upbuilding of the American merchant marine and has contributed many constructive suggestions along this line. His views bear the imprint of mature thought and study marking him as a man who thoroughly knows his subject.

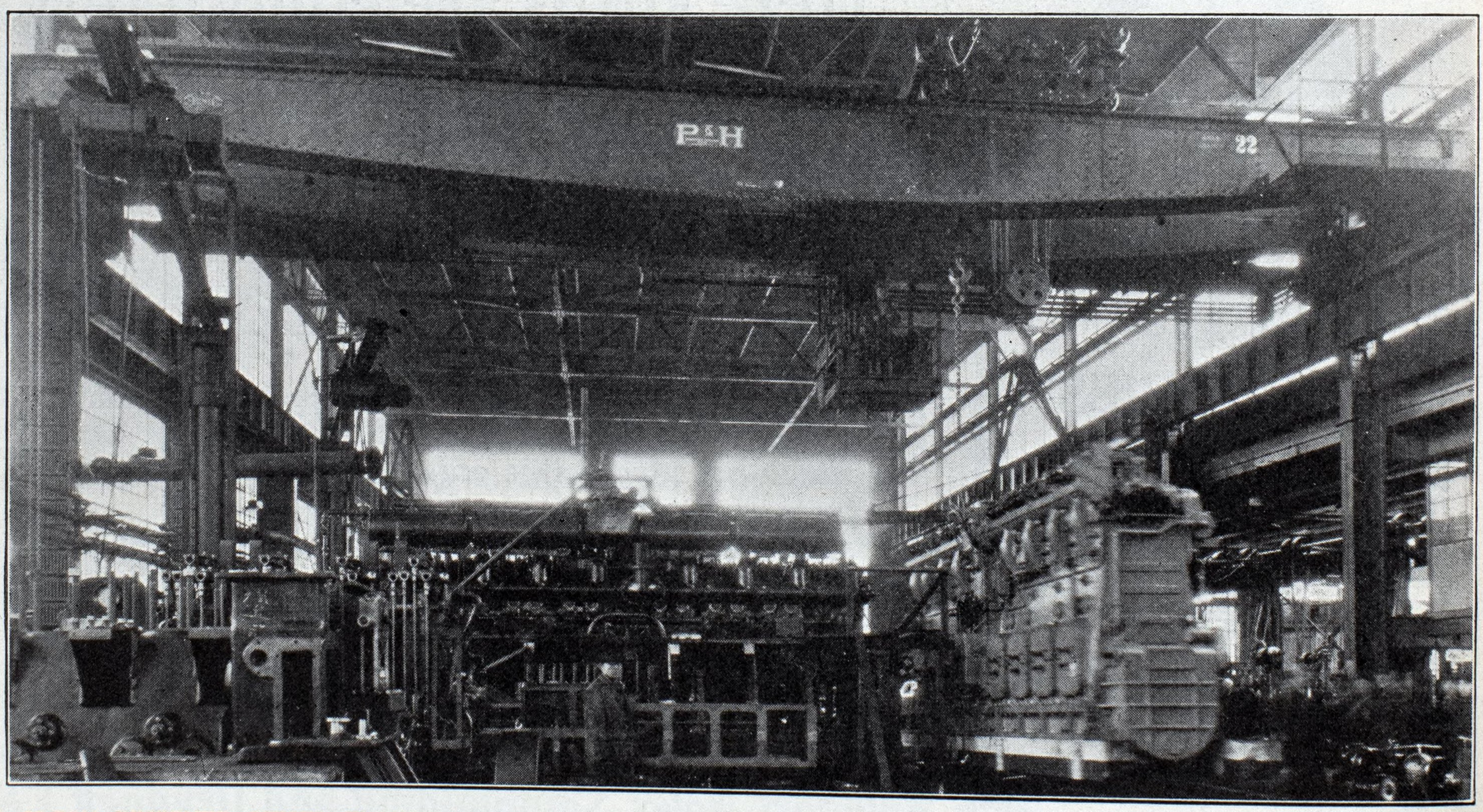
Golf is his favorite recreation. In this field he also has attained distinction being president of the California Golf association and vice president of the United States Golf association.

With its wonderful record of achievement during the last decade, the American-Hawaiian line is undoubtedly destined for still greater expansion under the leadership of Mr. Lapham for he is far visioned and has a keen perception of the opportunities for shipping development.

Direct From Test Bed to Freight Car

THE accompanying illustration shows a 1500-horsepower Bessemer diesel engine weighing 75 tons which is being picked up completely assembled for loading on a freight car without dismantling. This is a typical view in the Bessemer factory showing how the completed engines are moved from the test block to the shipping platform in a unit. Every Bessemer engine is given a thorough test run at the factory and after it has passed all of the rigid test requirements and has received its final adjustments and inspection, the engine is moved directly to the freight cars for shipment without being dismantled in any way.

At the time this picture was taken, early in May, there were 46 Bessemer diesel engines on the erecting floor in various stages of assembly. The 1500-horsepower engine on its way to the loading platform is one of the pair of 75-ton Bessemer diesel engines for the Manville ocean-going yacht building at Bath Iron Works.



A 75-TON BESSEMER DIESEL ENGINE LIFTED COMPLETEY ASSEMBLED FROM TESTING BLOCK DIRECT TO FREIGHT CAR FOR SHIPMENT TO BATH IRON WORKS FOR INSTALLATION INMANVILLE YACHT DESIGNED BY HENRY GIELOW, INC.

Welding for Ships

(*Continued from Page* 35)

made, and it took a great deal of study before these buttwelds were made successfully. Mr. Owens showed views of severe shock tests to which various welds have been submitted without breakage or other failure. His remarks brought out considerable information about successful designs in which welding stresses are equalized, and about different methods of reinforcing butt joints.

The different welding jobs which the Newport News yard has adopted as standard show the following average saving as a result of the adoption of the welding method: Weight, 16.9 per cent; labor, 21.4 per cent; cost, 23.3 per cent.

Questioned about the value of welded steel assemblies as compared with castings, Mr. Owens said there are many uses where castings are desirable. On the other hand, welded steel assemblies are more desirable than castings in many applications, particularly where a defective casting might prevent the builder from keeping up to his production schedule. He thought that one of the biggest savings to be obtained through welding was where a casting, if faulty, could hold up the work of the machine shop until a good casting could be obtained, whereas there are no such hold-ups in connection with welding jobs.

He told of some joints which had been both welded and riveted, but did not think much of such a combination on account of its cost. Welds, if properly made, do not need to be reinforced by rivets.

Photographs shown by Mr. Owens illustrated some highly developed apparatus which now is used in shipyard welding. One of these showed an automatic pipe welding machine for welding masts and other large sections. Another showed a gantry welding machine for welding bulkheads. Other views showed portable motor-generator sets, each set supplying current for a number of operators. Mr. Owens described the details of welding procedure control, by which the individual welders follow prescribed methods and thus are prevented from making faulty welds. Recently a test was conducted at the Newport News yard and not a single welder failed to pass it. In short, welding as applied to shipbuilding is on an efficient basis.

Barge Completes Long Tow

THE Young Brothers Ltd. pineapple barge which was towed from Seattle to Honolulu arrived in perfect condition despite continuous severe weather during the entire trip. This barge, built under the Ellis channel system of steel hull construction by Wallace Bridge & Structural Steel Co., Seattle, was provided with a specially designed curved rake built of channels. This feature increased the towing speed and gave seagoing qualities not found in barges of ordinary construction.

Other features to insure satisfactory performance in open water include ample freeboard. The dimensions are 10 x 40 x 140 feet and the deadweight capacity is 725 long tons on a 7-foot draft. The barge was built under the inspection of the American Bureau of Shipping. Delivery to Young Brothers Ltd. at Honolulu including towing from Seattle, was made within three and one-half months from date of contract. The barge is now being used as a pineapple carrier.



CHANNEL STEEL BARGE BUILT BY WALLACE BRIDGE & STRUCTURAL CO., SEATTLE

New Officers Are Elected New York S. B. Co.

At the annual meeting of the board of directors of New York Shipbuilding Company held in New York on April 18, the following officers were elected: W. M. Flook, chairman of the board; C. L. Bardo, president; E. I. Cornbrooks, vice president and general manager; J. F. Metten, vice president; N. R. Parker, vice president and treasurer; C. H. Dore, comptroller; J. A. Taylor, assistant comptroller; J. S. Ritchie, secretary and assistant treasurer; J. H. Irwin, assistant secretary and assistant treasurer; H. Matlack, cashier.

The resignation of J. E. Slater as vice president and treasurer was accepted by the board with many regrets. Mr. Slater leaves the service of New York Shipbuilding Company to accept a position with Coverdale and Colpitts, an outstanding firm of consulting engineers in New York.

The vacancies created by the resignation of Mr. Slater were filled by promotions as follows: N. R. Parker, from comptroller to vice president and treasurer; C. H. Dore, from assistant comptroller to comptroller; J. A. Taylor, from works accountant to assistant comptroller; J. S. Ritchie, from assistant secretary and assistant treasurer to secretary and assistant treasurer; J. H. Irwin, from cashier to assistant secretary and assistant treasurer; H. Matlack, from assistant cashier to cashier.

Sale of the steamer EASTERN LEADER to C. D. Mallory of New York, on behalf of a corporation to be organized for the sum of $88,000, was authorized by the shipping board recently. The vessel is a steel cargo steamer of 6248 deadweight tons, equipped with a triple expansion engine and scotch oil burning boilers. She has been laid up at New York since May, 1924.

The shipping board has authorized the sale of a vessel to the American Scantic line to replace the steamer CASPER which stranded off the coast of Finland in December, 1928, and became a total loss. The purchase price of the substitute vessel, which remains to be selected, will be met from insurance recoveries on the CASPER, in accordance with the contract covering the sale of the American Scantic line. The amount will be based upon the recommended sales price of the vessel selected. The shipping board steadily continues to sell ships to private owners.

River Transportation

(*Continued from Page* 47)

barges have a capacity of 1500 barrels each, while three are capable of carrying 2500 barrels each.

Barges are loaded at Kenova by means of a combination of incline plane with floating terminal. Cement is taken from silos by mechanical conveying equipment to a cement valve bagging machine where the bag is filled. It is then carried by belt conveyor to a point where it is loaded on four wheel trucks, each truck holding five barrels of cement. The trucks are then wheeled to an incline car over the river embankment and lowered to a loading float on the river where the cement is placed in the barge. The empty truck is returned to the incline car and carried to the upper loading platform for the next load.

This company maintains a weekly schedule between Kenova and Pittsburgh, a distance of 160 miles, with transportation costs estimated at about 50 per cent less than rail charges. Increased use of river facilities will be effected with the completion of a project now under way at Neville Island, Pittsburgh, where a new cement plant will be operated in conjunction with a blast furnace and by-product coke ovens.

Some freight is transported by packets although this tonnage is not of large proportions and has not expanded with the rapidity of bulk cargo. Size of tows regularly moved from the Pittsburgh harbor varies according to load and conditions of the river and weather. For the long hauls as many as 19 barges are grouped in one tow. Six barges are commonly used in pool tows. The size of crew on each boat ranges from 15 to 30 persons.

Although the diesel engine has made its appearance on towboats, steam still predominates in number of installations on the rivers. This is partly due to the fact that a number of boats still in use were powered by steam before development of the diesel engine was well advanced, and also to the fact that some of the inefficiency formerly associated with steam power operation has been removed. The steam engine builder has recognized the competition brought about by the introduction of diesel power and has adopted modern appliances for economy. The tandem compound condensing engine has replaced the simple engine in a large measure and the water tube boiler has superseded the Mississippi type boiler. Steam economizers for utilizing waste gases in heating boiler feed water have been adopted, and improved methods have been introduced for treating feed water to reduce boiler scale. Another factor favoring the retention of steam engines, as described by one barge line operator, is the greater expense in employing engineers familiar with diesel engine operation. On the Mississippi river, particularly in the lower reaches, fuel oil has replaced coal to a large degree. Pulverized coal also offers possibilities for the future. It is the opinion of some that the desirability of using propellers with diesel engines because of their high speed, in a measure has retarded the expansion in adoption of this type, inasmuch as drift wood in the rivers and lack of backing power have made the propeller less adaptable than the slow moving stern or side wheel. Both of these deterrents, however, are being corrected.

It is evident that the present freight carrying facilities on the Ohio river are adapted mainly to the movement of large tonnages of bulk material. Formation of small barge lines to operate on tributary streams to carry small individual cargoes and to serve as feeders for the large barges is pointed to as the most effective means of extending river service to the many small manufacturers of the Ohio valley.

Terminals also are necessary. Practically all of the terminal facilities in operation at present are privately owned. Plans now are being made at Pittsburgh for the first unit of a river-rail shipping terminal, with an adjoining warehouse. St. Louis, on the Mississippi river, has provided excellent freight handling facilities. A $1,000,000 municipally-owned dock, including two warehouses with storage facilities for merchandise has been built. Hoisting equipment includes six cranes. The dock is served by railroad tracks built and controlled by the city, providing accommodations for 60 railroad cars for direct rail-barge transfer.

To what extent freight traffic on the Ohio river will grow in future years is difficult to estimate. It is believed, however, that future expansion will eclipse the pace of the past decade, now that this great roadway of commerce is ready for increased use, and will be limited only by the future growth of the country.

The new 8000 gross ton turboelectric liner building for the Grace line by the New York Shipbuilding Co. at Camden, N. J., will be named the SANTA CLARA. The vessel will be 482 feet long, 63 feet 9 inches beam and 37 feet 5 inches deep.

Mechanical Firing Used

(*Continued from Page* 52)

the upstream load consisted of 30 barges; now from 36 to 40 barges are taken, depending on river conditions. So we have not only gained in increased power but we have also gained by increasing the upstream load. In my judgment, if the upstream load was no greater now with the stoker intsallation than it was prior to its installation there would still be a substantial reduction in consumption of fuel because with the heavy load the engineer naturally works a longer cut off which would increase the fuel consumption."

Service Proves Economy of Stoker

Experience with the RICHARDSON shows clearly the economies that can be obtained through mechanical firing in increased power and reduced fuel cost per indicated horsepower, to say nothing of the added advantage of being able to improve on the personnel of the "black gang," or possibly reduce the number required. Stokers of this type are applicable to any externally fired boilers.

Through mechanical firing efficient combustion of coal at low cost of operation can be obtained and in view of the probable increase in the price of oil, referring not only to fuel oil but to diesel oil, and the present trend toward a reduction in the price of coal particularly screenings, it appears that coal will be the logical fuel not only on inland waters but in ocean service. For the latter service the only objection is the cargo space taken up. By use of mechanical firing the cost of labor can be reduced to a minimum; one man to a watch is all that is necessary.

The shipping board recently authorized the sale of the steamers BAR HARBOR and YORK HARBOR, the former being purchased for $31,000 cash by Emil Stray, Norway, and the YORK HARBOR for $35,000 cash by M. Chr. Stray of Norway. The purchaser in each case was granted the privilege of carrying one outbound cargo of grain, coal or scrap iron from the United States to a foreign port but must refrain, under bond, from operating the vessel thereafter to or from any United States port. Both vessels are steel cargo steamers of 3521 deadweight tons, equipped with reciprocating engines and Scotch coal burning boilers and have been laid up since 1921. Apparently the policy of getting rid of government tonnage is being consistently carried out by the shipping board to the benefit of the private owner.

Handling Costs Cut

(*Continued from Page* 58)

reasonably be expected of each piece of equipment under given conditions, but also requires knowledge, based on provable facts, as to life of the equipment, operating cost, maintenance and repair cost, and obsolescence. The job of selection cannot be left to shipping clerks, gang bosses, or any minor officials. It cannot safely be left even to an expert purchasing agent. It is a job that calls for the best executive and engineering brains in an organization. Furthermore, such effort on the part of the highest executives will in almost every case pay larger dividends than any other effort requiring an equivalent amount of brains, vision, and time. If by devoting a whole week's time to the careful selection of one power-operated truck or tractor costing perhaps $3000, a responsible executive can save his company twice that amount per year, his time is certainly well spent.

Writing a performance specification, and seeing that it is carried out, is not an easy job, but it pays, and pays well. Reputable manufacturers are only too willing to help formulate such a specification, for they realize that the only real measure of value is *value in use.* A piece of equipment is not a piece of furniture or decoration, it is a tool, bought not for its appearance or the merit of its materials, but solely for what it will do. That principle is applied everywhere in selecting men. Why not apply it as carefully in selecting machines?

Much Experience in Other Fields

With the experience records of railroads and industrial plants to draw on, plus the accumulated knowledge of equipment manufacturers, there is no reason why buying on performance cannot be the rule instead of the exception. The one essential factor in bringing about this practice is executive vision, of the right kind and caliber. This country is fortunate in having plenty of executives with the necessary vision, and those who have applied that vision to problems in this field have produced results that have revolutionized whole industries. One of the secrets of American progress has been the ability and energy of our industrial leaders in solving such problems almost as soon as they become recognized.

Another problem, which is really a part of buying performance, is that of providing competent operating management of men and equipment used to handle goods. The best equipment, operating under the most ideal physical conditions, will not bring maximum results in economy unless there is some one man responsible for coordinating all of its operations. Some of our largest and most successful industries go so far as to appoint a special high official to this duty, calling him "manager of plant transportation," or by some similar title. Practically all of the automobile companies have such an official, as have many other companies whose total tonnage of goods handled is considerably less than that handled by many steamship companies over their piers.

Analyze Every Operation Carefully

The experience of every company that has made a scientific study of handling goods shows clearly that no operation is too small or infrequent for expert study. At the same time, it shows with equal clearness that the best results can be obtained only when the problem is handled by men of sufficient ability and vision to see it as a whole, and to "integrate" all its diversified parts into a smoothly running whole. The same sort of executive ability that has revolutionized production is now being turned to problems of distribution, and the results are already apparent.

The surface has hardly been scratched as yet. The application of simplification and standardization to equipment for handling goods has just been begun. Its extension to packaging methods, sizes of containers, and many kinds of equipment looms over the horizon. Every business that has a problem of handling goods can help to speed up progress by carefully studying its own problems and finding means to solve them. The steamship business, being one of the oldest and most important of all, has perhaps the most complicated problem of all. But complexity no longer frightens business executives. Instead, it presents an instant challenge to action. The most complex and industrial and commercial problems can be "broken down" into their elements and solved just as our shipbuilders have solved problems that would have seemed hopeless a few generations ago.

Vessels Sold for Scrap

Sale of 23 laid-up vessels to the Union Shipbuilding Co., Baltimore, with the understanding that the vessels be completely dismantled and scrapped, was authorized by the shipping board on May 15. The sum of $385,000 was received for the ships which represent in the aggregate approximately 200,000 deadweight tons.

Cooper and Bessemer In Consolidation

The Cooper-Bessemer Corp., a recent consolidation of the C. & G. Cooper Co., Mt. Vernon, O., and the Bessemer Engine Co., Grove City, Pa., represents another sizable combination of two pioneer engine building firms.

The C. & G. Cooper Co., Mt. Vernon, O., now in its 96th year, has had an unbroken engine building experience, covering nearly a century. Thousands of steam engines, gas engines and recently diesel engines, located all over the world, have established an enviable reputation of Cooper built engines.

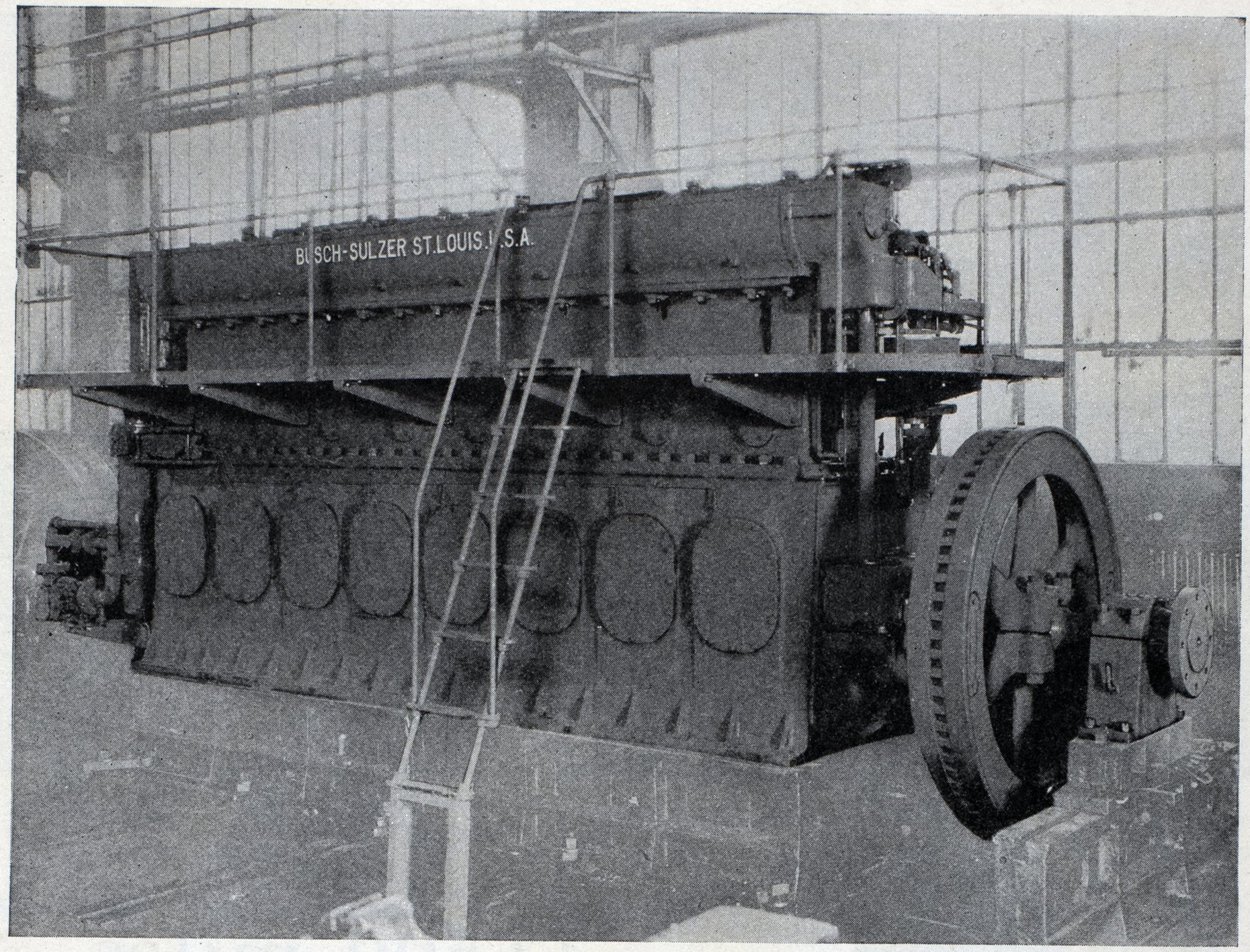
The Bessemer Engine Co., Grove City, Pa., has built engines for 31 years and has more units of the size built in operation than any other manufacturer. In recent years Bessemer diesel engines have occupied a leading position among American built diesels, especially for marine service.

The combined engineering talent of these two old but progressive companies should insure a still stronger position for Bessemer diesels in the future. They will also have unlimited research facilities for developing new features of design. The diesel industry generally may expect to profit from the developments made possible by such an organization and American diesel users will need no longer look to Europe for refinements of design.

Charles M. Reagle, formerly in charge of Bessemer diesel sales, has been made a vice president of the new corporation and is in full charge of all diesel sales service. All correspondence regarding diesel engines should be addressed to Grove City, Pa., or one of the territorial offices, listed in the corporation's advertising.

William Perrott, formerly marine superintendent of the United States Lines under the shipping board regime, has been named operating manager of United States Lines, Inc., the new owners of the service.

The Todd Shipyards Corp. has been awarded the contract to provide Todd oil burning equipment for the Hudson River Night line's steamer FERDINAND GORGES, recently bought from the Main Central railroad. She is being remodeled to provide for the transportation of automobiles, trucks and trailers and will enter the New York-Albany-Troy service about June 15 to go on regular schedule.



BUSCH-SULZER DIESEL

FOR DRIVING MACHINERY IN

SELF UNLOADING COAL BARGE "MAIDA"

The Pringle Barge Line carries coal a very short distance on the Great Lakes at a very low cost. Handling charges are reduced to a minimum by automatic unloading machinery, supplied with cheap, reliable Diesel Power.

America's Oldest Diesel Builders

BUSCH-SULZER QUALITY-DIESELS

31 Years Experience 1898-1929

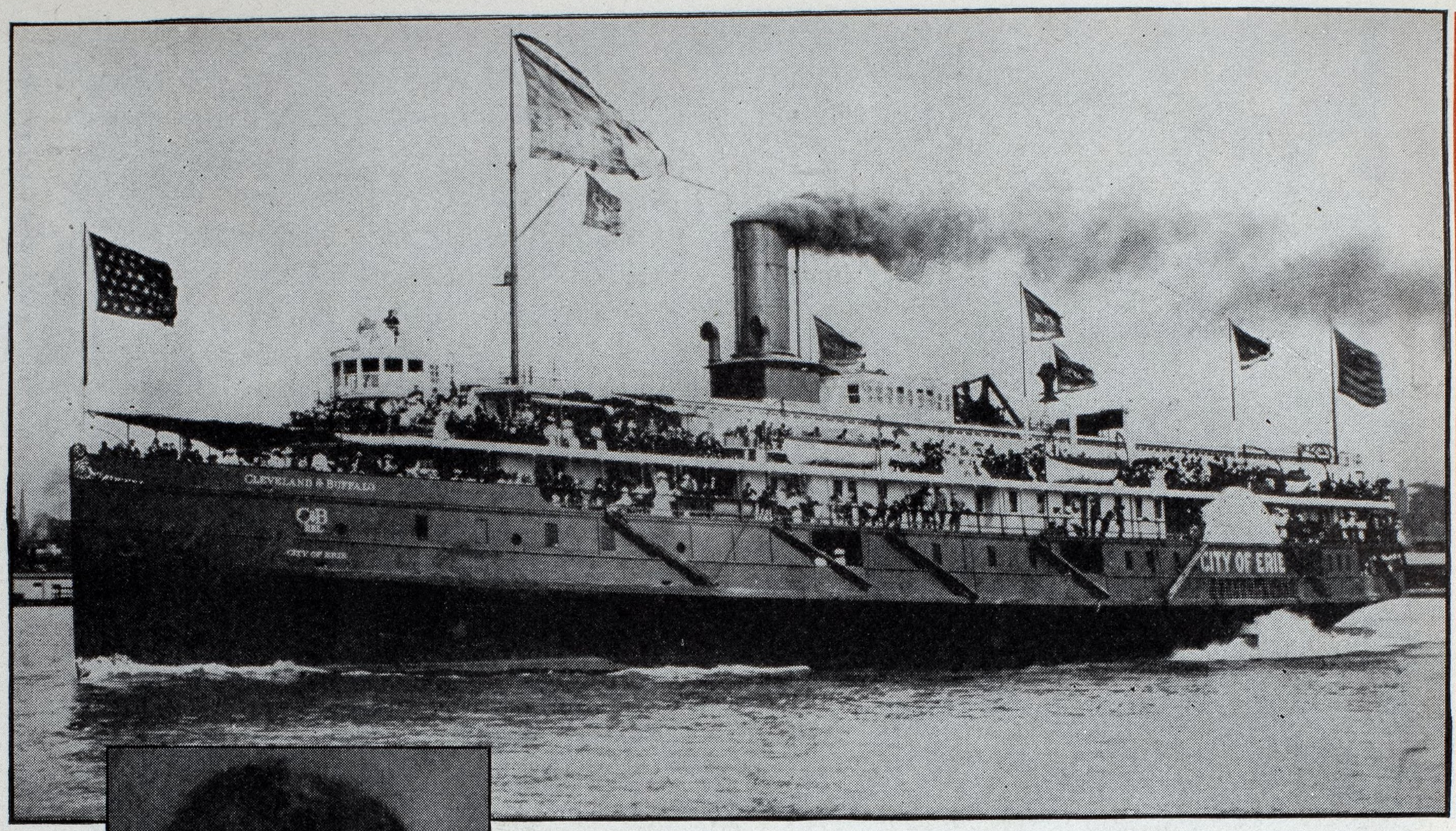
Sizes 150 - 6000 BHP

BUSCH-SULZER BROS. - DIESEL ENGINE CO.

ST. LOUIS, MO.

Two Rector St.
New York

Rialto Bldg.
San Francisco



S. S. *City of Erie*, of the Cleveland and Buffalo Transit Company



P. J. Swartz, General Manager of the C. & B. Line

12,500 miles in a 72-day season

The S. S. *City of Erie*, of the Cleveland and Buffalo Transit Company, is one of the fastest steamers on the Great Lakes. She has to be to maintain a stiff schedule on the Cleveland-Port Stanley run. Every day during the 72-day season she makes a round trip over the 87-mile route on Lake Erie—totalling 12,500 miles for the season.

Regular maintenance of such a schedule requires unusual care in the engine room. Every precaution must be taken to insure maximum performance and continuous operation during the short Great Lakes season.

Well aware of the vital importance of correct lubrication in this respect, P. J. Swartz, General Manager of the C. & B. Line, and his corps of engineers rely on Gargoyle Marine Oils exclusively. They know from experience that these high-quality lubricants are the best insurance against untimely breakdowns and costly tie-ups for repairs; that they conserve power, reduce friction to a minimum and prolong the life of propelling machinery.

You will find Gargoyle Marine Oils on sale in every important port throughout the Great Lakes. One of our Marine Engineers will be glad at any time to help you solve lubrication problems which may arise. Simply write to: Vacuum Oil Company, Lake Marine Department, 925 Euclid Avenue, Cleveland, Ohio.

NOTE: On request we will send you, without obligation, our authoritative marine lubrication treatises: "Steamships with Reciprocating Engines" and "Turbine Propelled Steamships."

GARGOYLE

Marine Oils

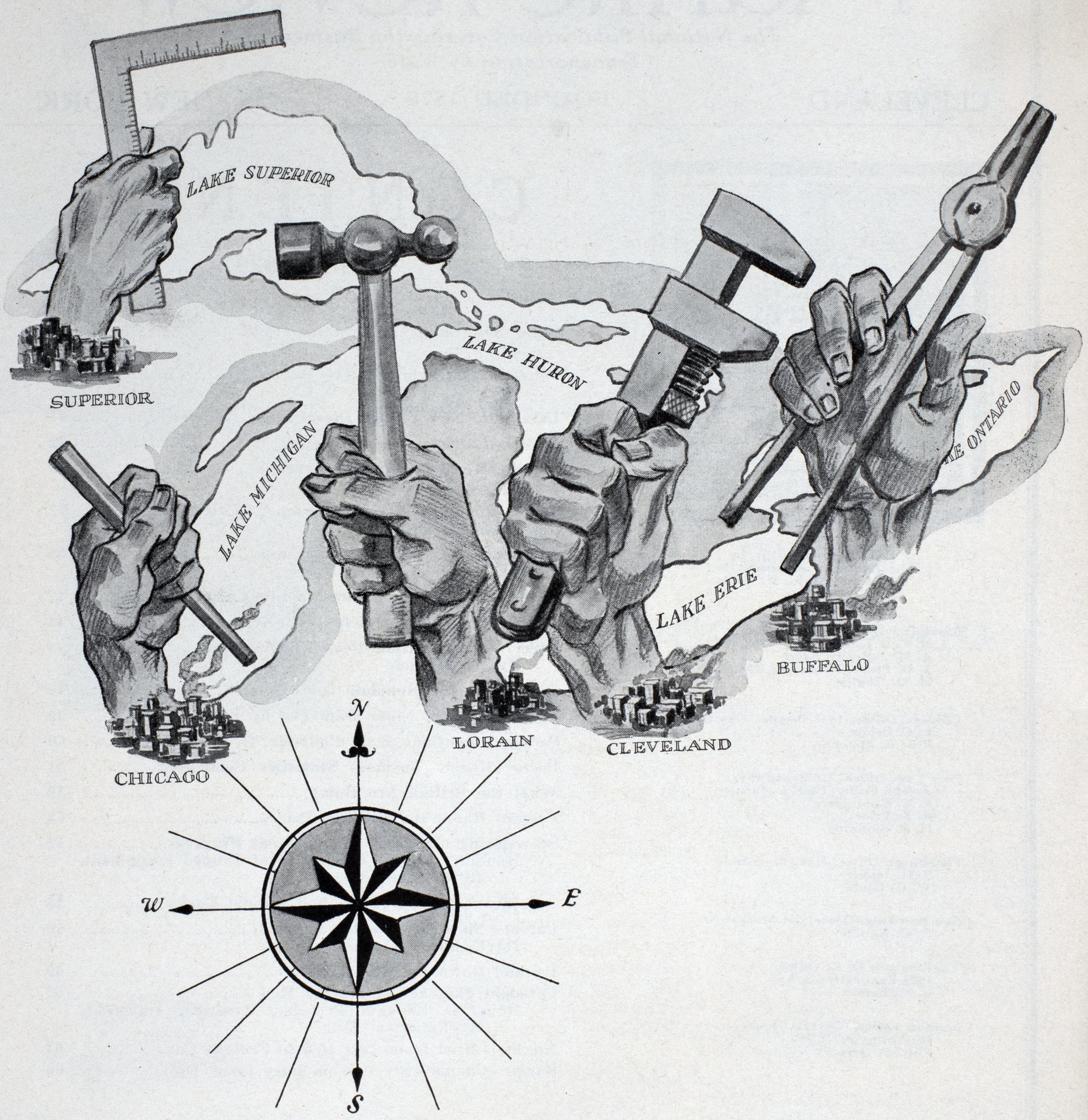
A grade for each type of service

Vacuum Oil Company

Specialists in the manufacture of high-grade lubricants for every class of machinery Obtainable everywhere in the world

New York, U. S. A.

From strategic points on the Great



The AMERICAN

CLEVELAND
American Ship Building Co.

LORAIN
American Ship Building Co.

BUFFALO
Buffalo Dry Dock Company

Lakes these hands stretch out to help

NO matter whether ships are badly battered by storms or collisions, or whether the damage is comparatively trivial, these hands are always on the job for emergencies. They are always ready to stretch forth and help you.

They are your great repair resources: Hundreds of skilled workmen, architects, engineers, draftsmen; and complete equipment, dry docks, giant planers, lathes, boring mills, big forges, and floating scows. This expensive manpower and machinery is maintained by the American Ship Building Company at the strategic points of the Great Lakes to restore your ships to service, to serve you swiftly on any repair job.

You expect it of course. You need this service. Ship operators today realize that these repair resources, which only the completely equipped ship building companies provide, are vitally essential to Lake shipping. They realize, too, that economical maintenance of such men and materials bespeaks a big volume of repair business. So, more and more, ship operators are turning to the completely equipped ship building companies for all of their repairs—for the small jobs as well as the big, swift, emergency jobs.

SHIP BUILDING Co

SOUTH CHICAGO
Chicago Ship Building Co.

SUPERIOR
Superior Shipbuilding Co.



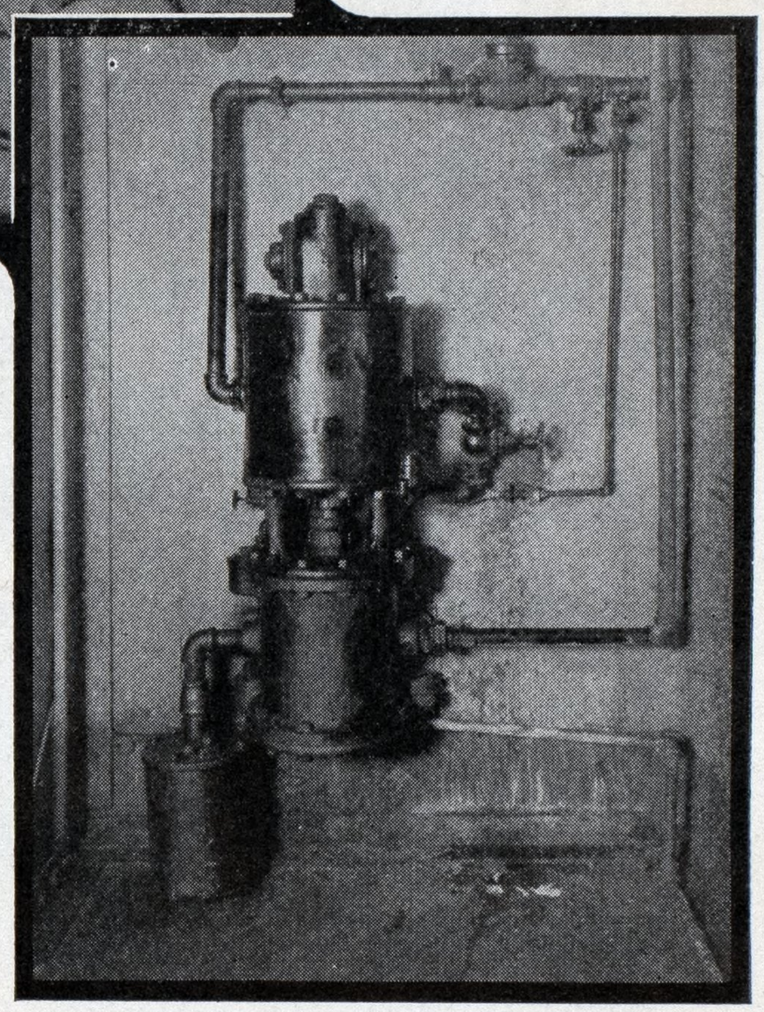
Scaling the bulwark of A. H. Bull & Co.'s S. S. "Cornelia" with Keller size OX Super Valveless Scaling Hammers — air supplied by Westinghouse compressor.

Compressed Air Cuts Scaling Costs

The hand chipping method of removing rust, paint, or scale from the deck and sides of a ship is slow and inefficient. The modern way—with compressed air—is quicker, more convenient, more economical.

Many steamship companies have equipped vessels with WESTINGHOUSE compressor outfits for this purpose, finding that for the price of one scaling contract with hand chippers, a complete compressor equipment and accessories could be purchased. This also provides a ready means for cleaning flues and machinery, spraying paint, and making emergency repairs.

A trial installation on one boat has time and again demonstrated such marked advantages that the entire fleet eventually was equipped. The following well known steamship companies are outstanding examples: Matson (including the speedy "Malolo"), Isthmian, Export, Luckenbach, A. H. Bull, Dollar, and the United States Lines Inc. (including the famous "Leviathan").



The Westinghouse steam driven Air Compressor is compact, rugged, easy to install, therefore ideal for use on board vessels, in the harbor, and in ship yards. Made in four sizes—35, 49, 66, and 150 cu. ft. displacement . . . Motor driven compressors are also available—a complete line, in sizes up to 700 cu. ft. Write for descriptive literature.

Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

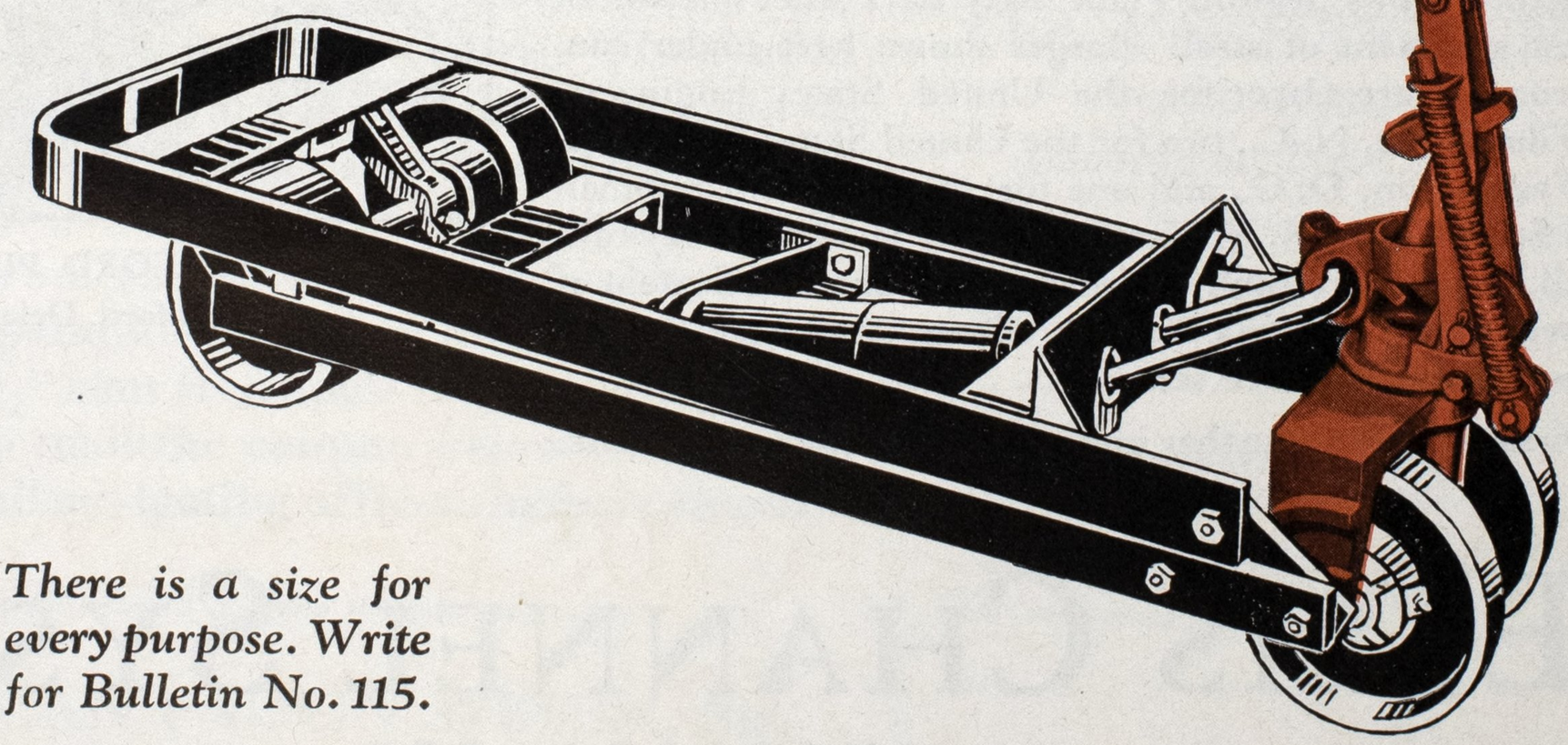
WESTINGHOUSE—NATIONAL

Air Compressors

"QUALITY MACHINES FOR QUALITY SERVICE"

Presenting the new RED HEAD lift-truck built by BARRETT

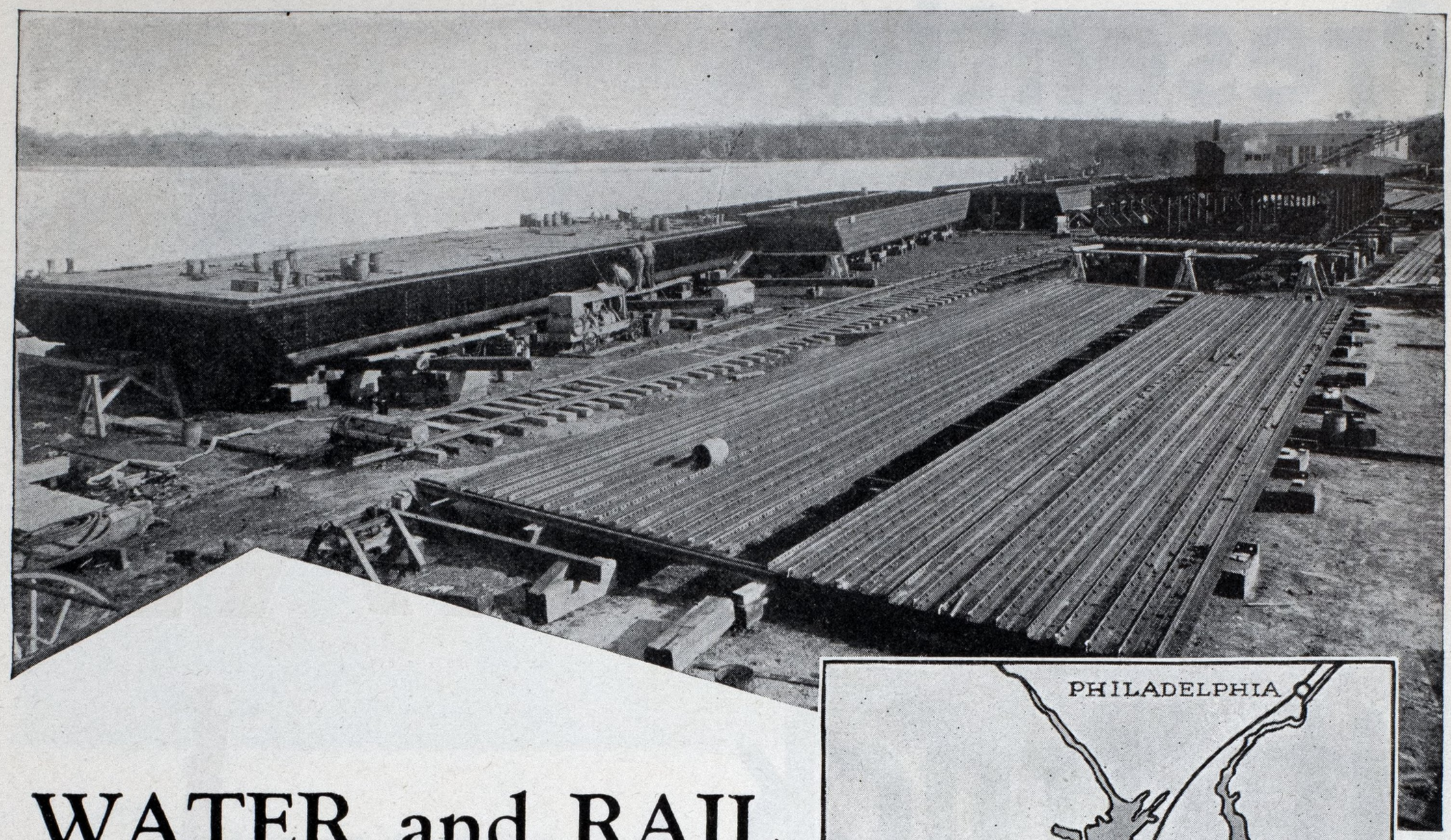




There is a size for every purpose. Write for Bulletin No. 115.

BARRETT-CRAVENS COMPANY

1339 WEST MONROE STREET CHICAGO, ILL., U. S. A.



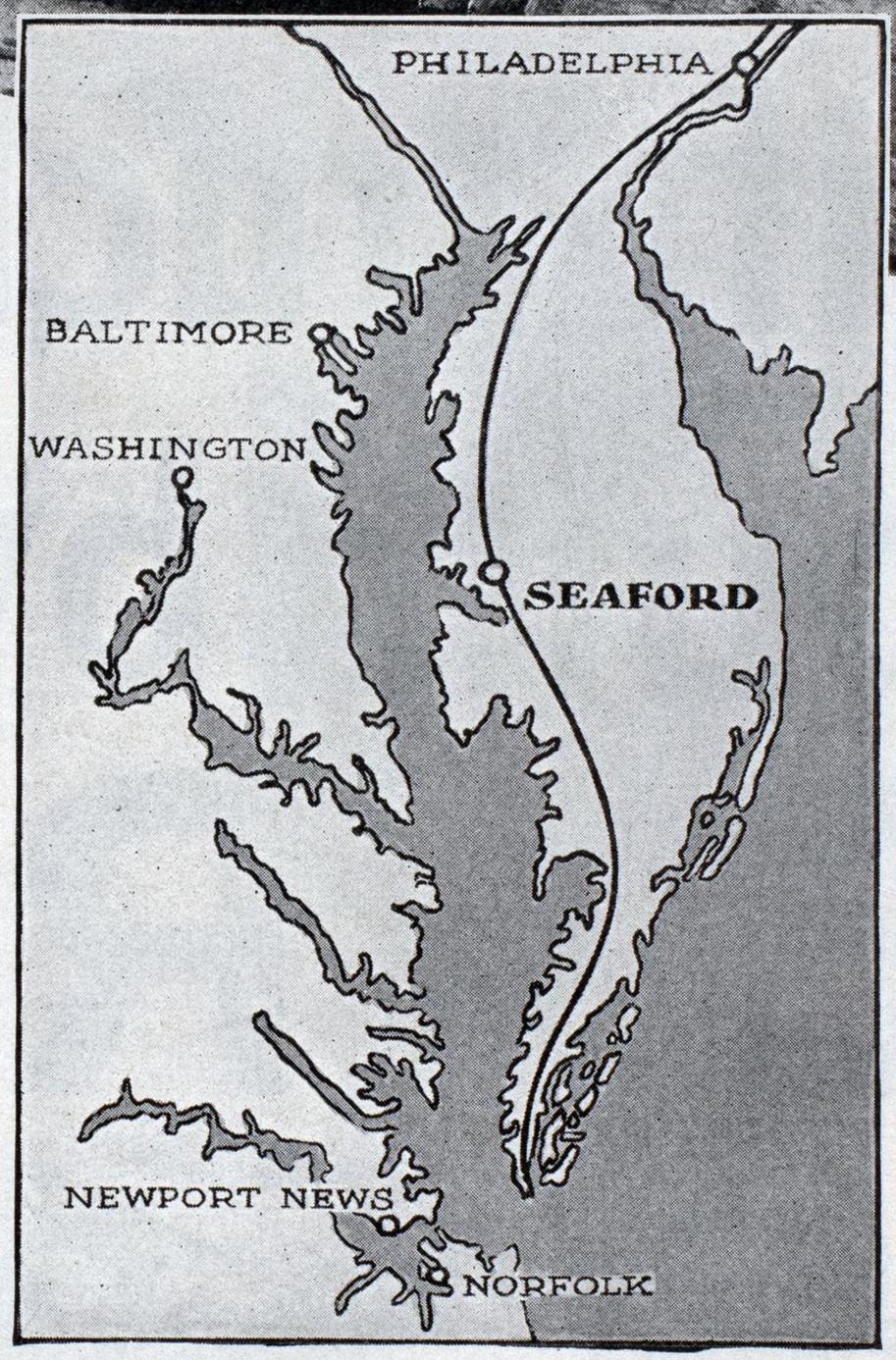
WATER and RAIL

New ELLIS Plant Speeds Construction

The Atlantic Ellis Channel System, Inc., in its new plant at Seaford, Delaware, offers owners a complete construction service. The Seaford Plant is on the main line of the Delaware Division of the Pennsylvania Railroad. Fast transportation for materials is assured. It is also located on deep water to Chesapeake Bay, giving easy access to the sea.

Picture shows Seaford Plant sixty days after arrival of first shipment of steel. Barges shown here under construction are: three for the United States Engineers, Wilmington, N. C., two for the United States Engineers, Washington, D. C., and one for the Merritt, Chapman & Scott Corp., N. Y. First barge was launched May 6th. All barges were built under the Ellis Channel System of Steel Hull Construction for clients who have one or more Ellis Barges in service.

Owners desiring further information are invited to write.



SEAFORD PLANT
Seaford, Delaware

ELLIS CHANNEL SYSTEM

INCORPORATED

PATENTED

Atlantic Division
ATLANTIC ELLIS CHANNEL SYSTEM, INC.
33 Rector St., New York

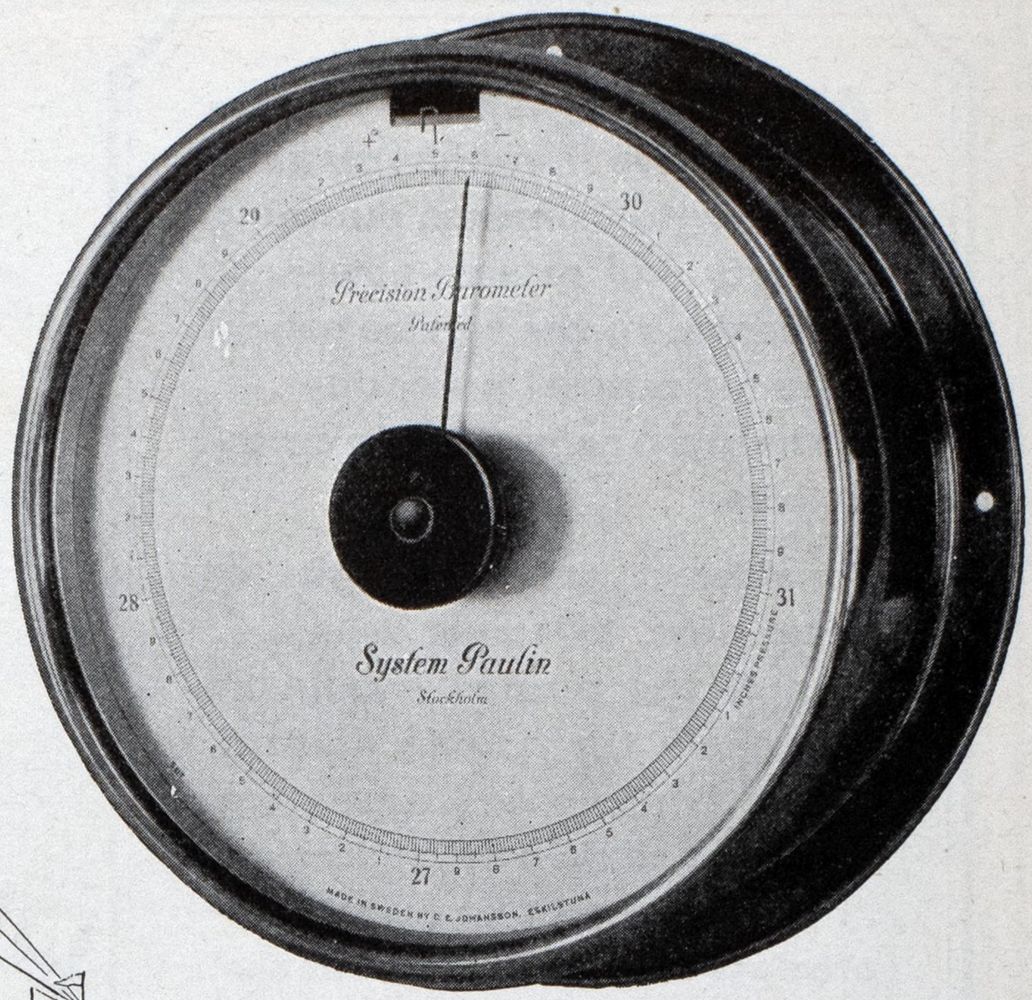
Pacific Division
ELLIS CHANNEL SYSTEM, INC.
3200 26th Ave. Southwest, Seattle, Wash.

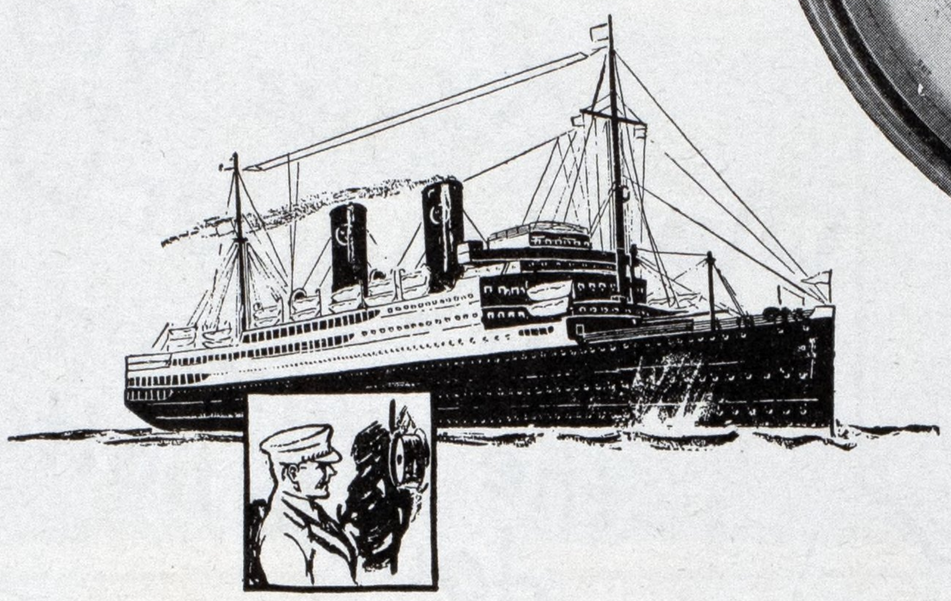
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Bring Your Ship BAROMETER EQUIPMENT

Up to the Highest Standard of Accuracy





The COMMODORE

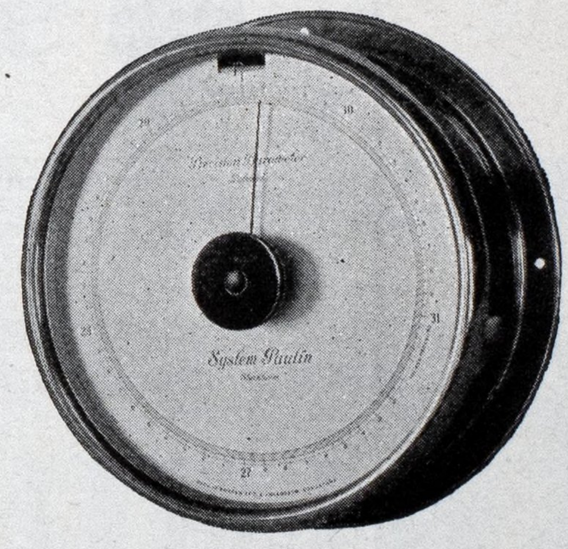
CODE WORD

Barometer Type BSL

RANGE: 26" to 31.2" mercury—graduated to 0.01" of mercury.

DIAL: Dull silver-plated with deeply etched tevt. Mounted in heavy brass case.

DIMENSIONS: Diameter of Dial: 6¾". Diameter of Flange: 8⅛". Height: 2¾". Weight: 3 lbs.



The YACHTSMAN

(CODE WORD)

Barometer Type BSS

Same as the Commodore except smaller in size and lower in price.

DIMENSIONS: Diameter of Dial: 4½". Diameter of Flange: 5½". Height: 2½". Weight: 23 oz.

YOU do not tap the face of the Paulin System Barometer to make a reading. For there are no gears, chains or bearings to "hang up" and lag in registering even the slightest changes in pressure. A Paulin System Barometer has the accuracy of a mercury barometer and can be more accurately and more easily read. It is more serviceable, more portable, and costs less. Paulin System Barometers for ship use are graduated to readings of 1/100 of an inch, but are so sensitive that lesser changes are registered. Its sturdy construction insures long life of trustworthy dependability. There is no finer instrument made for the weighing of atmospheric pressure. The Paulin System Barometer shows at a glance the rise or fall of the glass. Every vessel should carry at least one Paulin System Barometer as a standard for checking the ordinary aneroid barometers aboard. Every shipmaster should read the pamphlet, "Origin and Development of the Barometer," sent free upon request. Ship owners are invited to mail the coupon below for enough copies to supply all navigating officers in their employ.

Dealers are invited to write for particulars

The AMERICAN PAULIN SYSTEM, *Inc.*

Makers of Precision Pressure Gauging Instruments

General Offices and Manufacturing Laboratories
1220 MAPLE AVENUE . . . . LOS ANGELES, CALIFORNIA

Dealers in principal cities of North and South America, China, Japan and United States Possessions

MSA-4

The American Paulin System, Inc.
1220 Maple Avenue, Los Angeles, Calif.

Please send me a copy of your catalog section regarding Paulin System Barometers and . . . . . copies of "Origin and Development of the Barometer," free.

Name.....

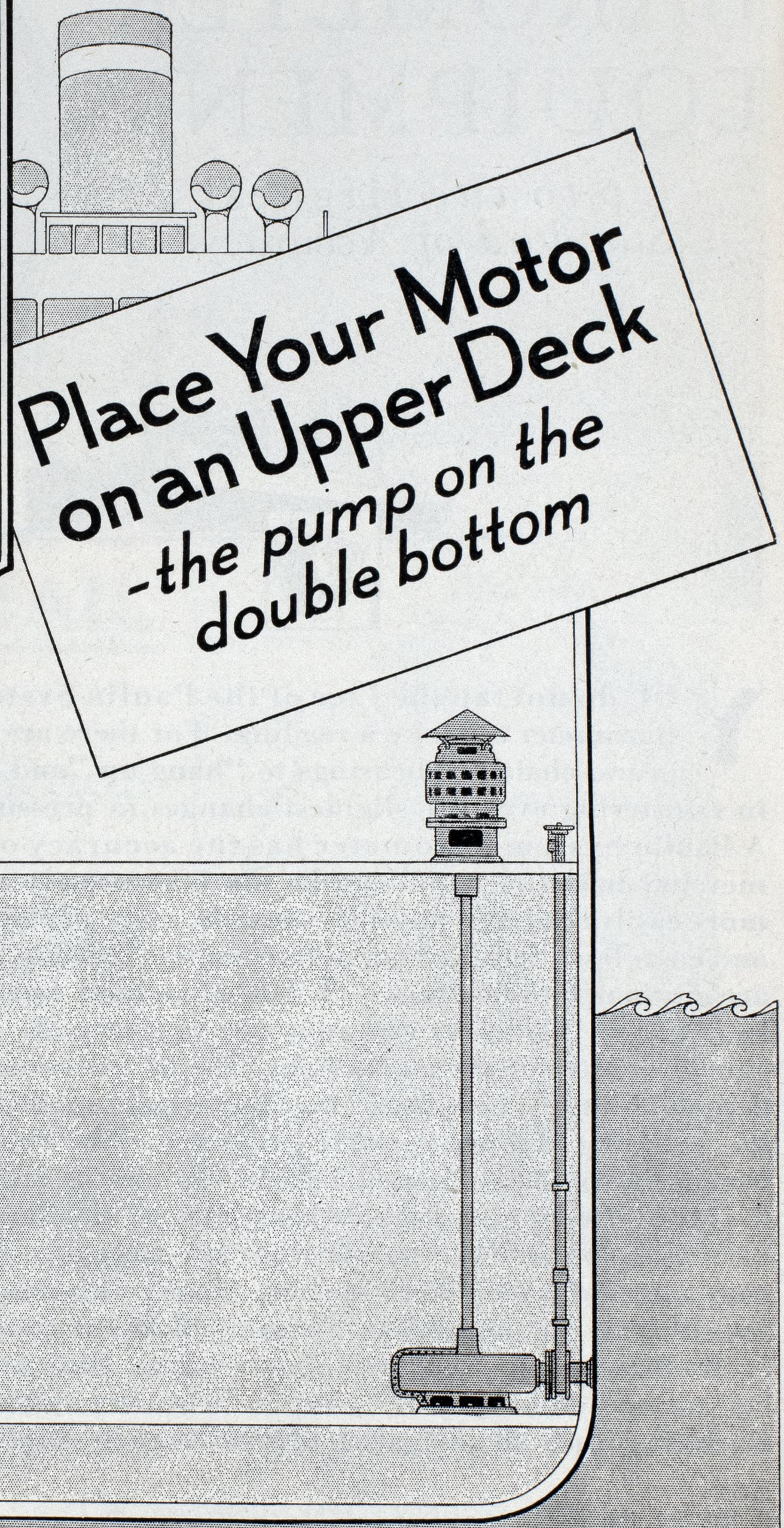
Company.....

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City.....

ANOTHER advantage of electric drive . . . motor-manned pumps with immense pumping capacity and reserve power . . . connected to the service generators for normal operation . . . to the main generators in emergencies.

Consider a safety margin of water line to upper deck . . . even if the pumps should be located on the double bottom, their driving power, the motors, may be placed on an upper deck . . . a construction you will appreciate in critical times at sea.



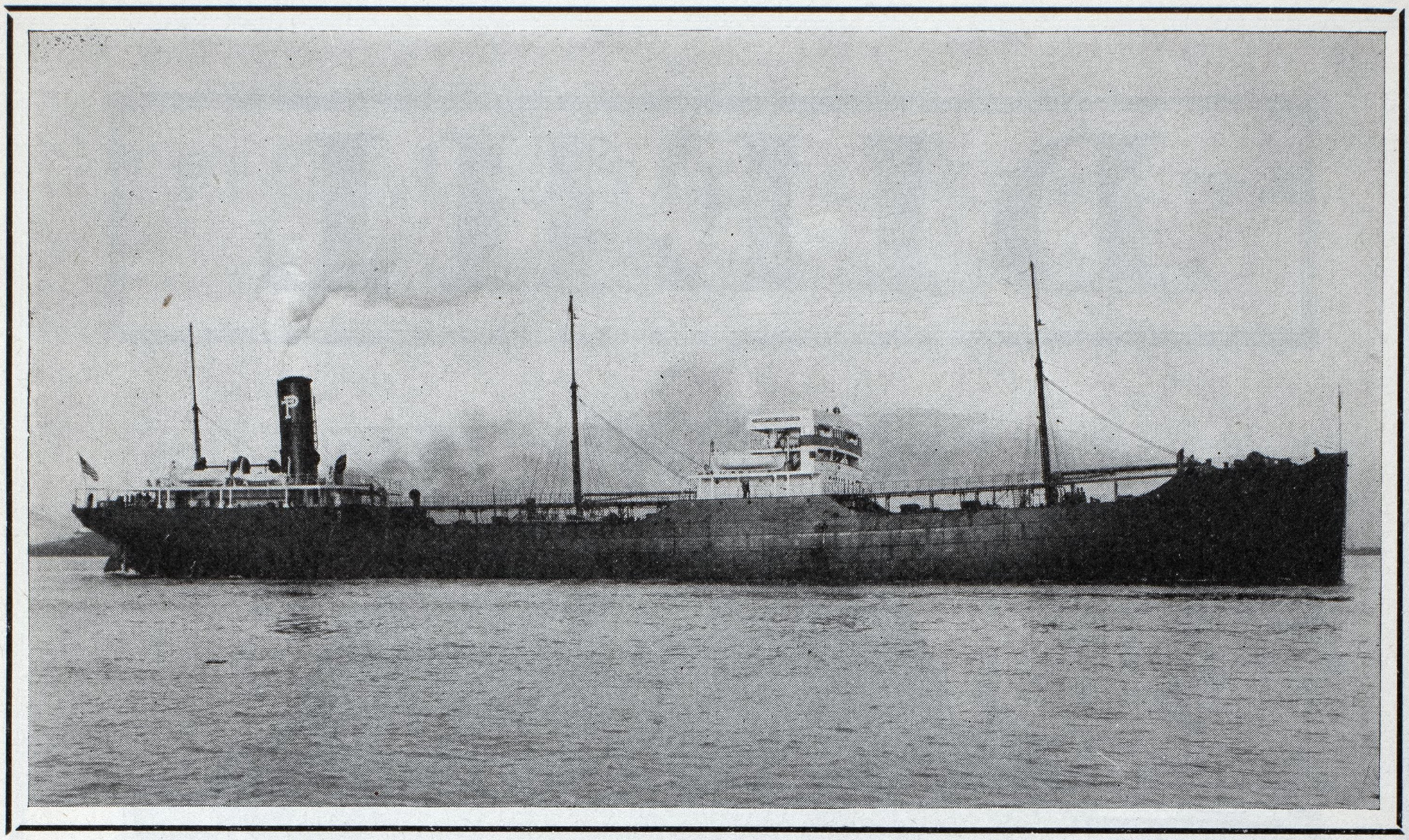
Place Your Motor on an Upper Deck

-the pump on the double bottom

GENERAL ELECTRIC

231-25

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S. S. Crampton Anderson, shown above, is one of a number of tankers built and engined completely by Bethlehem for the Pan-American Petroleum and Transport Company. Dimensions: 435′ x 56′ x 33′ 6″. Gross tonnage: 6998 tons. Dead weight: 10,200 tons. Speed: 11 knots.

Ships *of the* Pan-American Petroleum and Transport Company BUILT BY BETHLEHEM

OSCAR D. BENNETT — FREDERIC EWING — GEORGE G. HENRY

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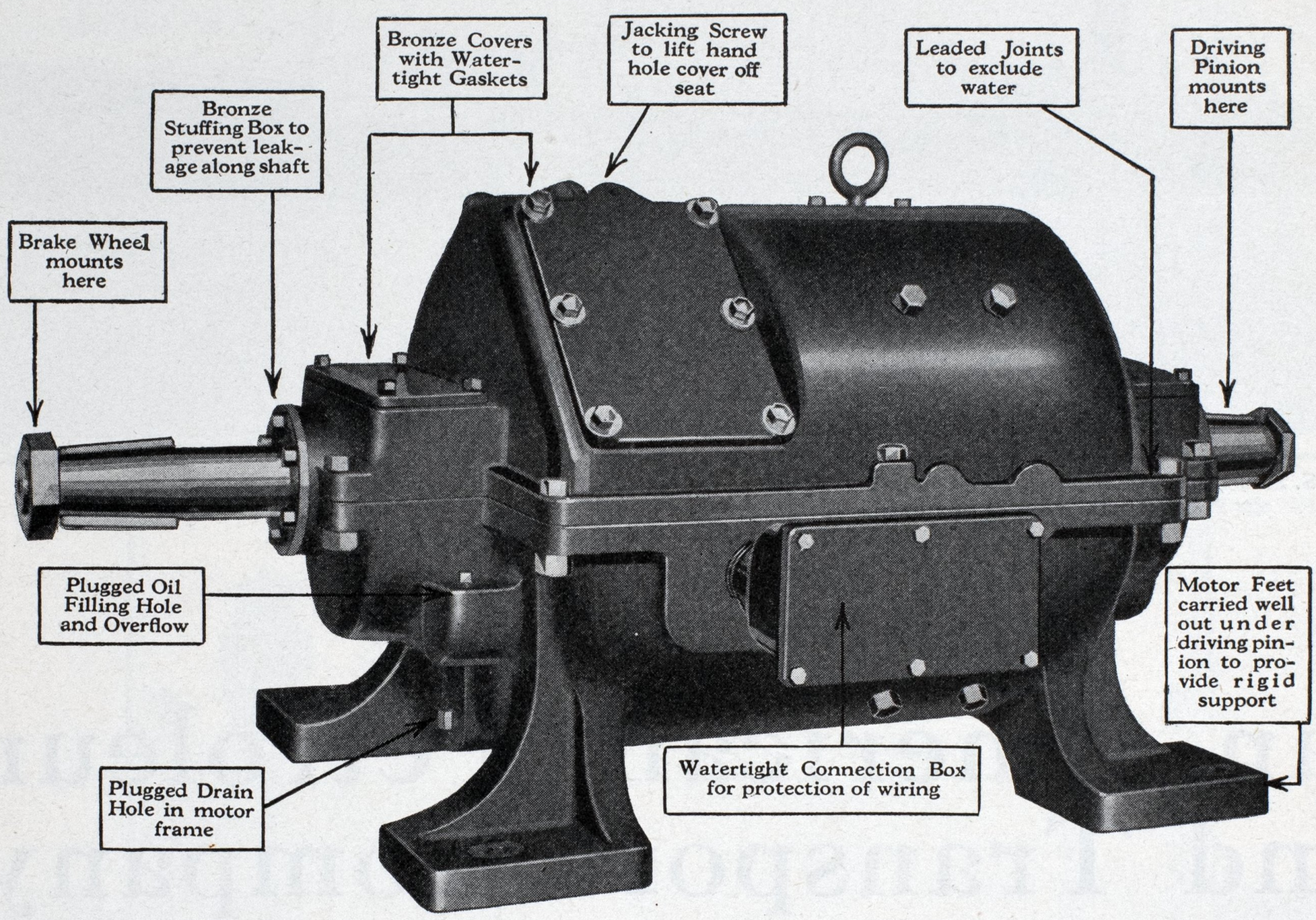
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DIEHL



Heavy Duty Watertight Deck Motor

Marine Insulation **Non-Corrodible Fittings**

designed and built in accordance with
the requirements of the

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Elizabethport, N. J.

SPECIALISTS in the intricate task of Modern Ship Construction

THE long list of notable ships constructed in the yards of the New York Shipbuilding Company is augmented each year by vessels built to the most modern standards of naval architecture.

It is the rule rather than the exception for ships constructed here to exceed by a liberal margin, the exacting contract requirements of current day marine engineering practice.

But of greater significance still are the day-in-and-day-out performances of ships launched here years ago . . . accentuating the fidelity of material, design and workmanship—always a paramount characteristic of New York Ship morale.

This same pride and tradition of personnel dominates the plant today with its increased diversification and magnitude of operation.

Our facilities are available for the design and construction of craft of all sizes . . . merchant or naval.

New York Shipbuilding Company

CAMDEN NEW JERSEY



New York Shipbuilding Company has constructed vessels for the following private corporations:

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Atlantic & Caribbean Steam Navigation Co.
Atlantic, Gulf & Pacific Company
Atlantic Transport Company
Baltimore & Ohio Railroad
Brooklyn Eastern District Terminal Company
Carpenter O'Brien Company
Chesapeake & Ohio Railway Co.
Coastwise Transportation Company
Consolidated Coal Company
Darrow & Mann Company
Delaware, Lackawanna & Western R. R. Co.
East Coast Transportation Company
Electric Ferries, Incorporated
Empire Engineering Corporation
Great Lakes Dredge & Dock Co.
J. M. Guffey Petroleum Company
Gulf Refining Company
W. R. Grace & Company
Hudson Navigation Company
Hudson River Day Line
International Cement Corporation
Lehigh Valley Railroad Company
Long Island Railroad Company
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Morgan's Louisiana & Texas R. R. & S. S. Co.
Munson Steamship Company
New York Central Lines
New York Engineering Company
New York, New Haven & Hartford Railroad
New York, Philadelphia & Norfolk R. R.
Old Dominion Steamship Company
Pacific Coast Steamship Company
Pacific Mail Steamship Company
Pennsylvania System
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Reading Company
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Southern Pacific Company
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KILL FIRE WHILE IT IS YOUNG



ALFITE kills the fires you cannot see

Cargo hold fires are hard to fight because you can't see just where they are. Kill the fire in one spot and it may break out in another.

Fire-killing ALFITE Gas penetrates every crack and crevice. No smoldering fire can escape it. Flood the hold with this gas and the fire is instantly out. And it stays out, for fire and ALFITE Gas cannot *both* live in the same space—and ALFITE always wins.

The ALFITE System discharges this fire-killing gas from cylinders through fixed piping into the space to be protected. Operation may be both manual and automatic. A simplified valve seals against all possibility of leakage and assures rapid gas discharge making this the most efficient system available for extinguishing cargo hold fires...The cost of the ALFITE System is moderate—the result of American-LaFrance and Foamite engineering and manufacturing.

If you are interested in this system of protection, write us for full details. American-LaFrance and Foamite Corporation, Engineers and Manufacturers, Dept. J16, Elmira, N. Y.

AMERICAN-LA FRANCE AND FOAMITE PROTECTION

A Complete Engineering Service

For Extinguishing Fires

ONS

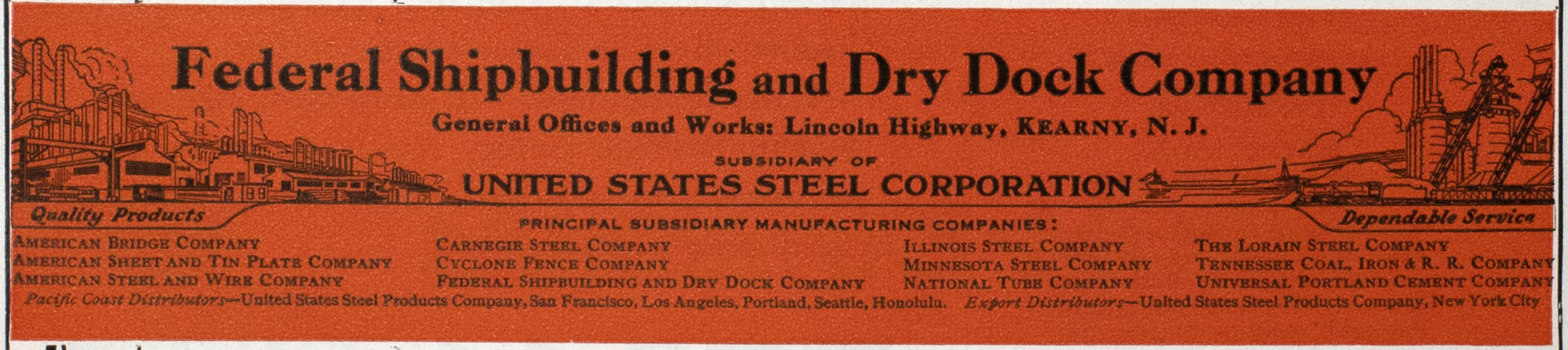
Ships live a long time—today when past their first youth, they can be given a new lease on life by repowering and remodeling. The tendency for

that modern magic for ships—conversions

FEDERAL is experienced in handling large reconditioning and conversion jobs—Some of the largest on the Atlantic Coast have been successfully completed—Unsurpassed shop facilities together with trained personnel make possible the greatest efficiency and economy both in time and expense of accomplishing the work. The Shipowner also has the advantage of dealing with an organization of ship-builders, familiar with all phases of marine work.

ERAL CONVERSI

higher powers and higher speeds with more economical fuel consumption, and with limited passenger accommodations has been made possible and practicable. It is easy enough to build with entirely new materials and specifications—to "make over" economically and skilfully presents unusual problems, requiring the talent of a shipbuilding organization combined with a plant of extensive and diversified facilities to accomplish a satisfactory result. These requirements are fully met at FEDERAL . . . . The M. S. "Courageous" by conversion and reconditioning was changed from an obsolete freighter of 9½ knots to a modern 13 knot Diesel electric craft. The "E. T. Bedford", originally built at Federal with steam machinery, was converted at a later date to a direct-drive Diesel Tanker . . . . Others just as conspicuous are under way at present time. Federal's location near New York—30 minutes from business section—makes it convenient for owners to inspect



FED

their work—30 foot channel permits handling of large ships. These facts make it possible for FEDERAL to offer ships converted and reconditioned with the one ideal in mind—superiority of design—and workmanship.





Emergency . . . . lighting

When the emergency strikes, the storage batteries must "carry on" for the shut-down auxiliaries and supply the LIGHT so necessary to locate the trouble quickly. Trust Willard Marine Batteries to perform this double duty all through the crisis.

Quality built-in explains their dependability. The plates give long life. The connections hold fast in any sea or climate. The construction is known the world over for *durability*.

Willard engineers will work with your staff in figuring storage battery requirements for steam or motor installations, new or replacement, single ship or fleet.

Address Your Nearest Factory Distributor

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Statler Bldg., Rooms 1126-1127

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3916 South Canal Street

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1920 Scranton Road

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NEW YORK CITY, N. Y.
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3619 Walnut Street

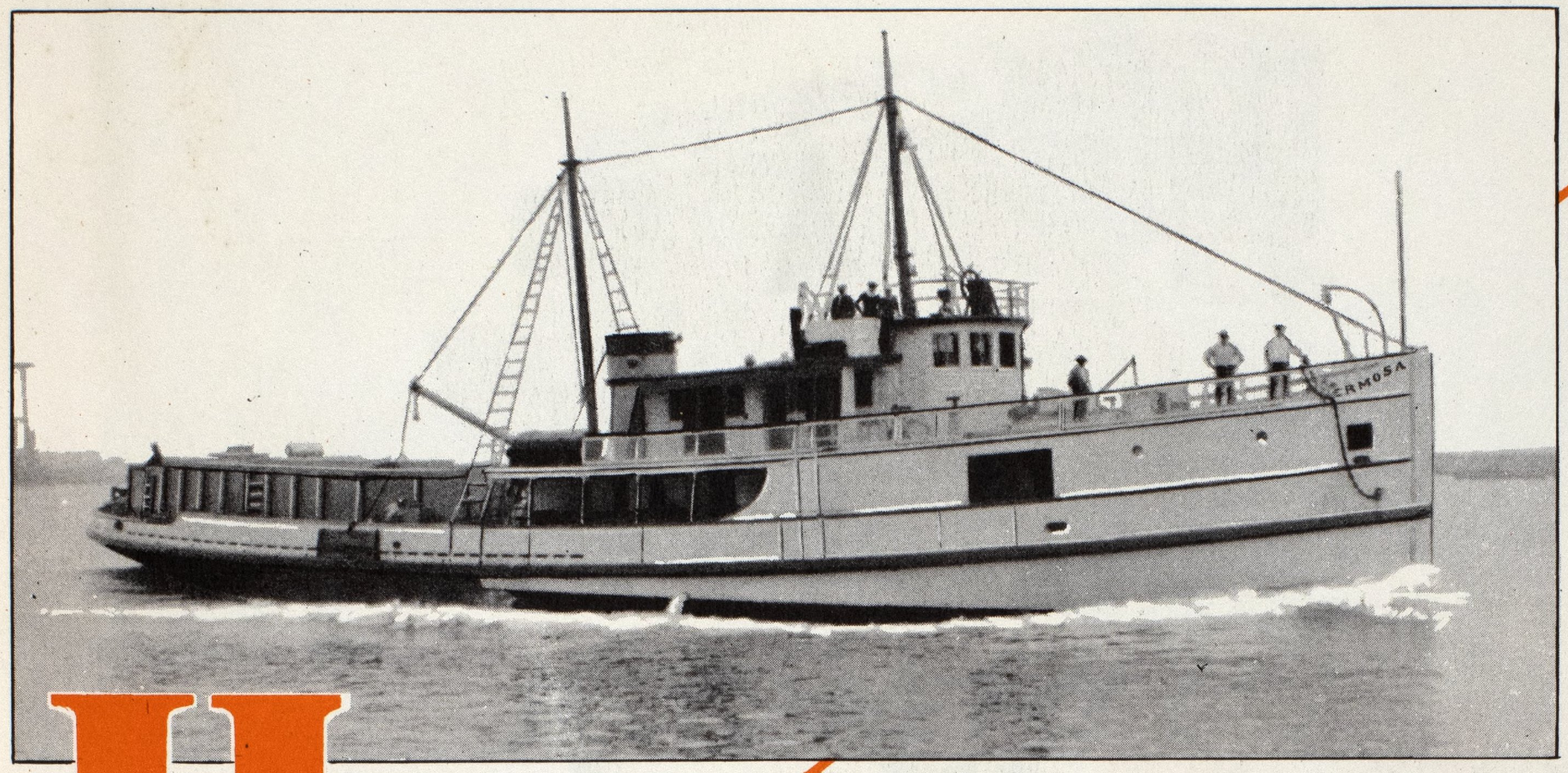
PORTLAND, OREGON
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SAN FRANCISCO, CALIF.
480 Second Street
1380 Bush Street

SEATTLE, WASH.
Fourth Ave. and Blanchard St.

Willard Storage Batteries are the result of over twenty-five years of battery manufacture. Lead, lead compounds, battery solution and all materials are thoroughly tested before going into the battery, and each battery is rigidly inspected before leaving the factory.

MARINE BATTERIES
Willard



Hermosa...

converted to *Largest Diesel Boat* for biggest game fish



The west coast fishing fleet has gained another "convert" to F-M Diesel Engines by the re-equipping of the "Hermosa."

Formerly a passenger steamer owned by the Wrigley interests, she has been rebuilt for tuna fishing and powered with an F-M 560 hp. propulsion engine and a 40 hp. auxiliary generating set furnishing electric power and light.

Two F-M electrically driven centrifugal pumps for circulating water in the bait tanks are also a part of the new equipment.

The result of this conversion makes the "Hermosa" with her 150 ft. length the largest Diesel powered tuna boat in the world.

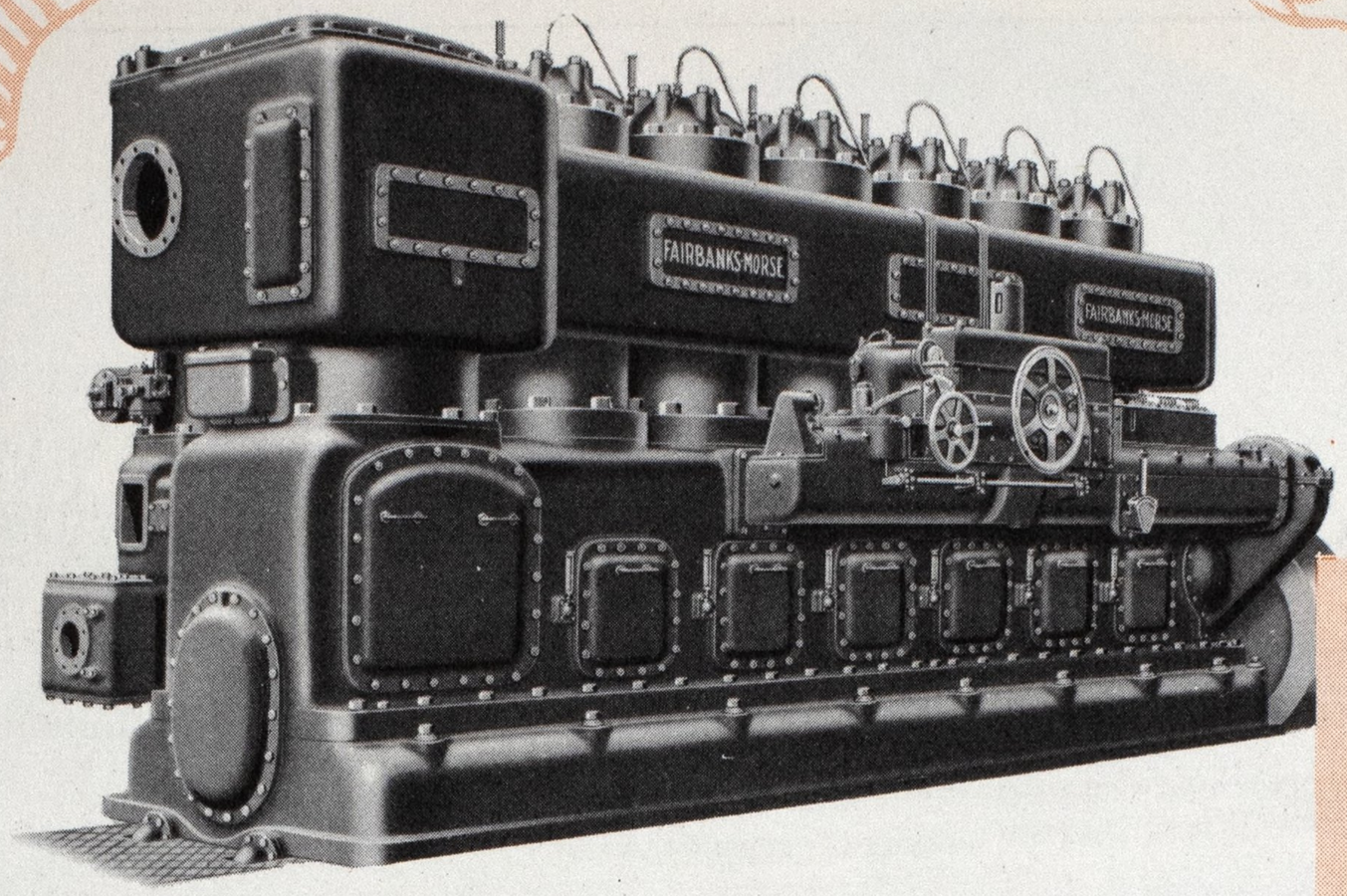
POWER PUMPING AND WEIGHING EQUIPMENT

FAIRBANKS-MORSE

DIESEL ENGINES

FAIRBANKS-MORSE DIESEL ENGINES

FAIRBANKS-MORSE F-M DIESEL ENGINES



F-M Model 37 Marine Engine of the same type as that installed in the "Hermosa."

F-M Diesels give Hermosa "Freedom of the Seas"

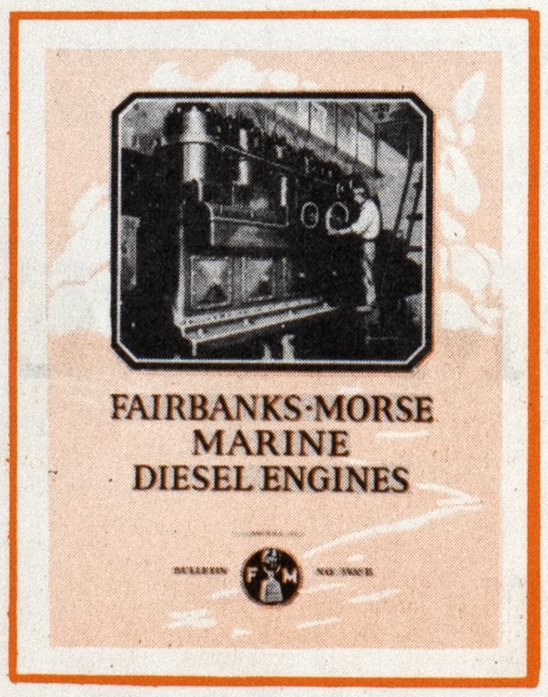
Formerly the saying, "I knew her when—" implied that a vessel had seen better days. With the Hermosa this is reversed.

Her new F-M 560 hp. Diesel propulsion engines and F-M 40 hp. Diesel auxiliary have given her advantages she could not possess as a steamer.

With her hull in fine shape, re-equipped with the most simple, over-all efficient power plant ever devised for marine use, with more power, extremely low fuel cost and no standby losses, she is a far better vessel than the original Hermosa.

And what is important to fishermen, her F-M Diesels have released her from the coal pile and given her the "freedom of the seas" with a fuel capacity sufficient for a normal 30-day trip at the speeds used in tuna fishing.

FAIRBANKS, MORSE & CO., *Chicago*
Branches with Service Stations in Principal Ports

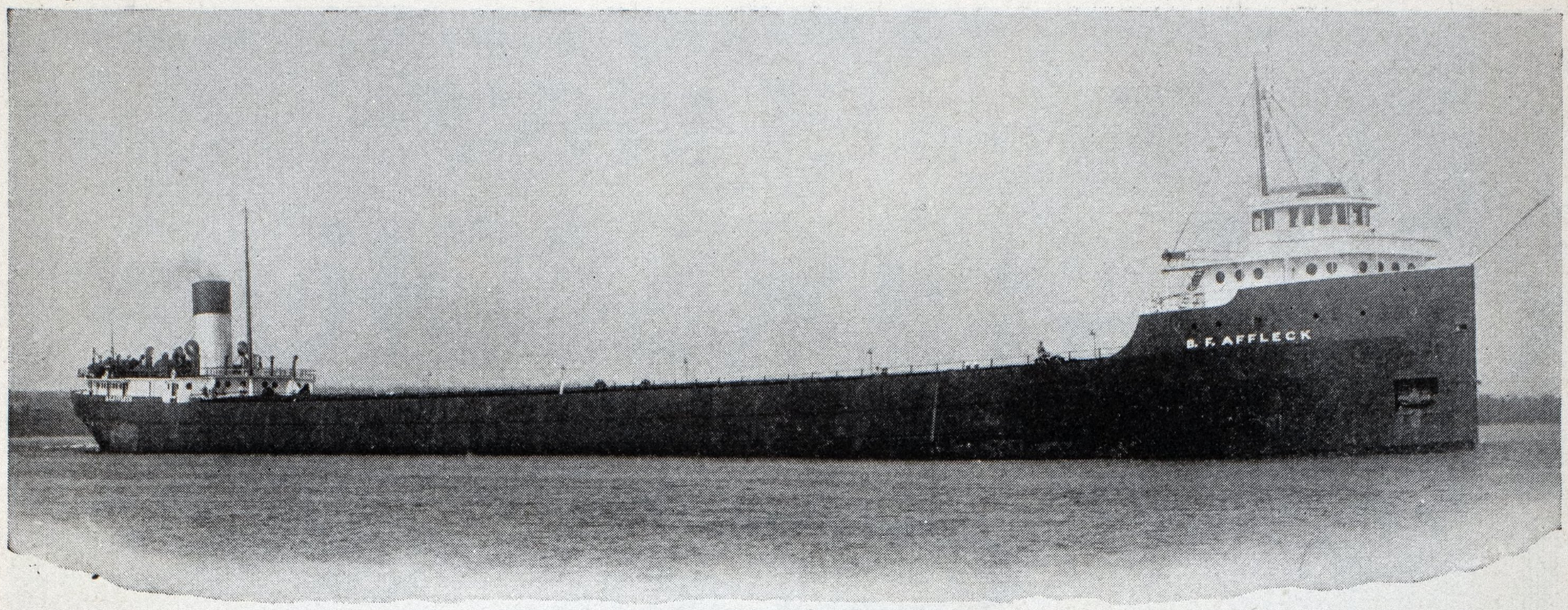


If contemplating converting an existing vessel or building a new one, it will be to your advantage to first read interesting publication 3500-B, "Fairbanks-Morse Marine Diesel Engines." Your copy awaits your request.

FAIRBANKS-MORSE

DIESEL ENGINES

OA27.236



B. F. AFFLECK

Finest Type of Great Lakes Cargo Carrier

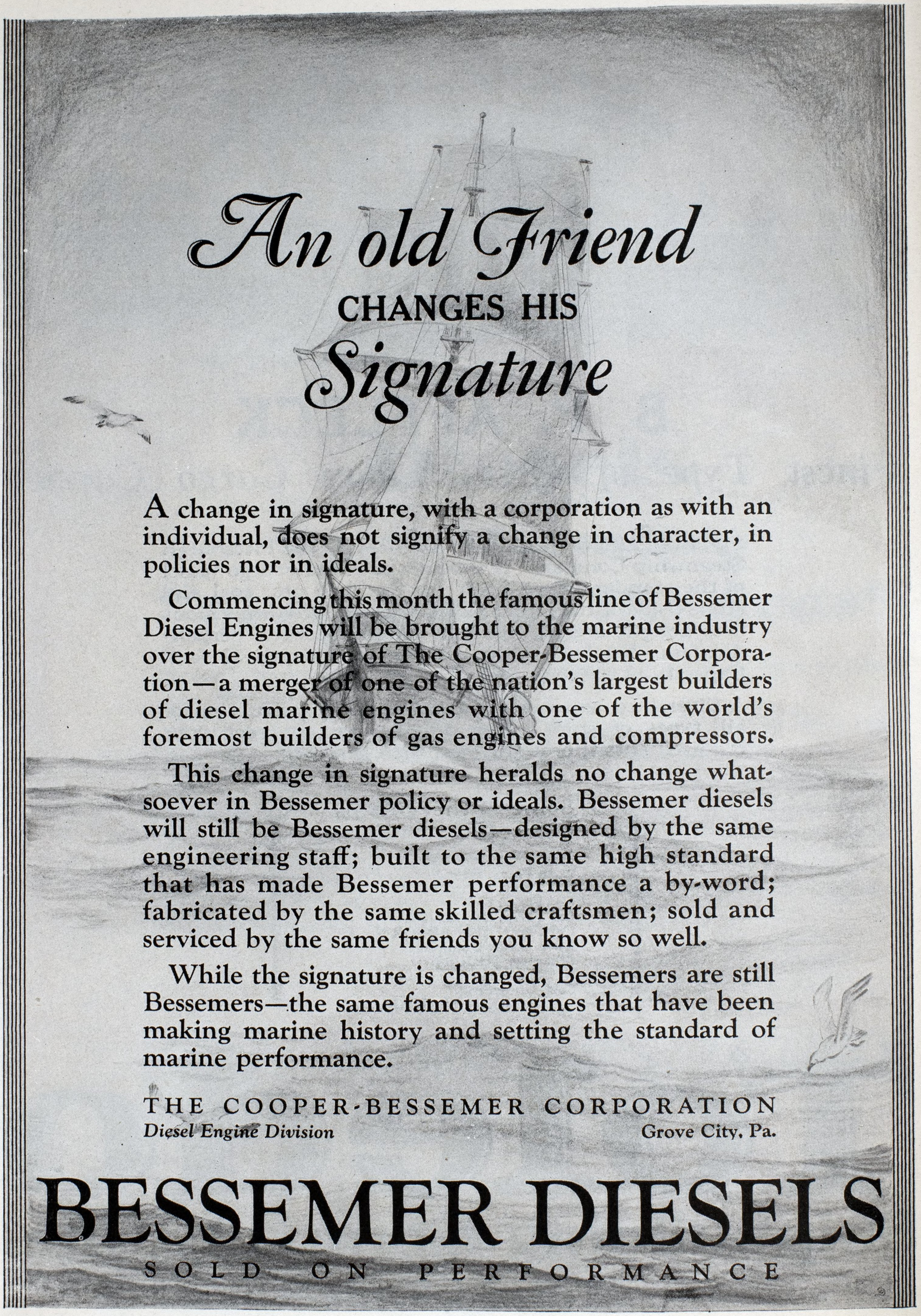
S.S. B. F. Affleck owned and operated by the Pittsburgh Steamship Company, is a single deck bulk cargo vessel of the standard type built for the iron ore, coal and stone trade of the Great Lakes. Her molded dimensions are: Length overall, 604 feet, length between perpendiculars, 580 feet; width 60 feet and depth 32 feet. Capacity 12,000 tons.

A diversified experience, covering the construction of all types of ships, fully qualifies us to meet *your* requirements thoroughly and with despatch.

Some Other Ships We Have Built

Auto Ferry, LA SALLE
Auto Ferry, ESSEX
Car Ferry, WABASH
Car Ferry, CHIEF WAWATAM
Car Ferry, ST. MARIE
Car Ferry, ANN ARBOR No. 5
Twin Screw Excursion Steamer, THOUSAND ISLANDER
Self Unloading, JOHN W. BOARDMAN

Toledo
Shipbuilding Company, Inc.
Toledo, Ohio



A change in signature, with a corporation as with an individual, does not signify a change in character, in policies nor in ideals.

Commencing this month the famous line of Bessemer Diesel Engines will be brought to the marine industry over the signature of The Cooper-Bessemer Corporation—a merger of one of the nation's largest builders of diesel marine engines with one of the world's foremost builders of gas engines and compressors.

This change in signature heralds no change whatsoever in Bessemer policy or ideals. Bessemer diesels will still be Bessemer diesels—designed by the same engineering staff; built to the same high standard that has made Bessemer performance a by-word; fabricated by the same skilled craftsmen; sold and serviced by the same friends you know so well.

While the signature is changed, Bessemers are still Bessemers—the same famous engines that have been making marine history and setting the standard of marine performance.

THE COOPER-BESSEMER CORPORATION
Diesel Engine Division Grove City, Pa.

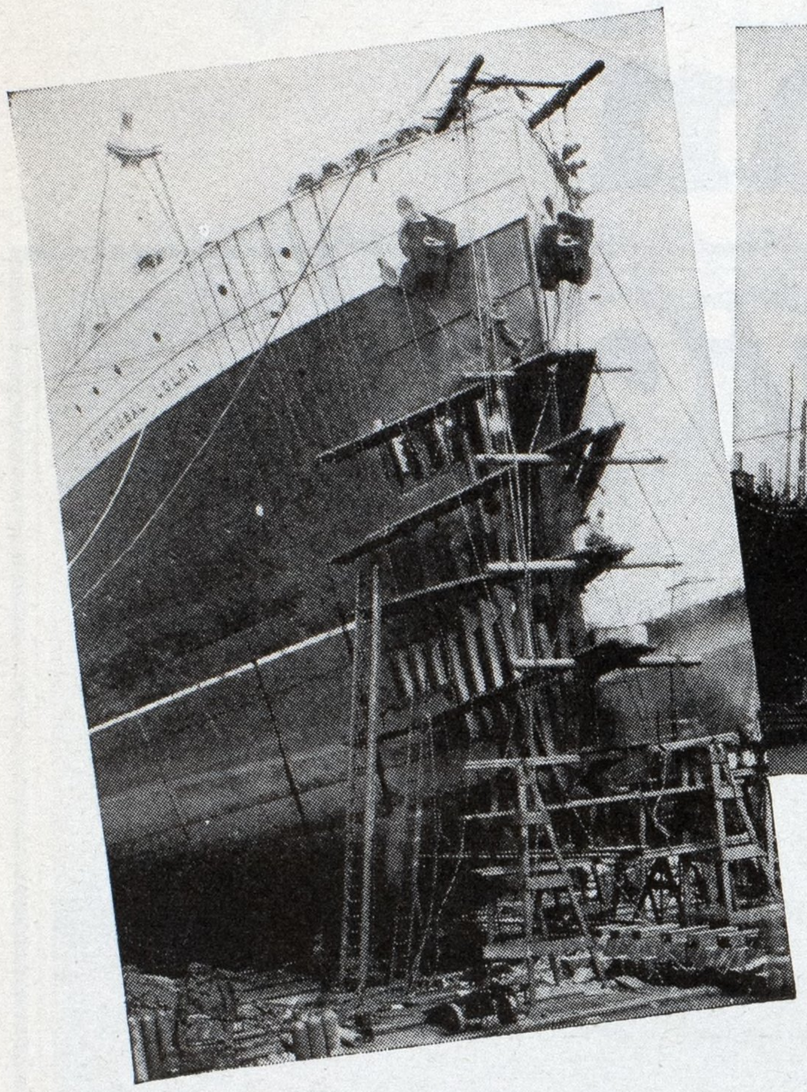
BESSEMER DIESELS

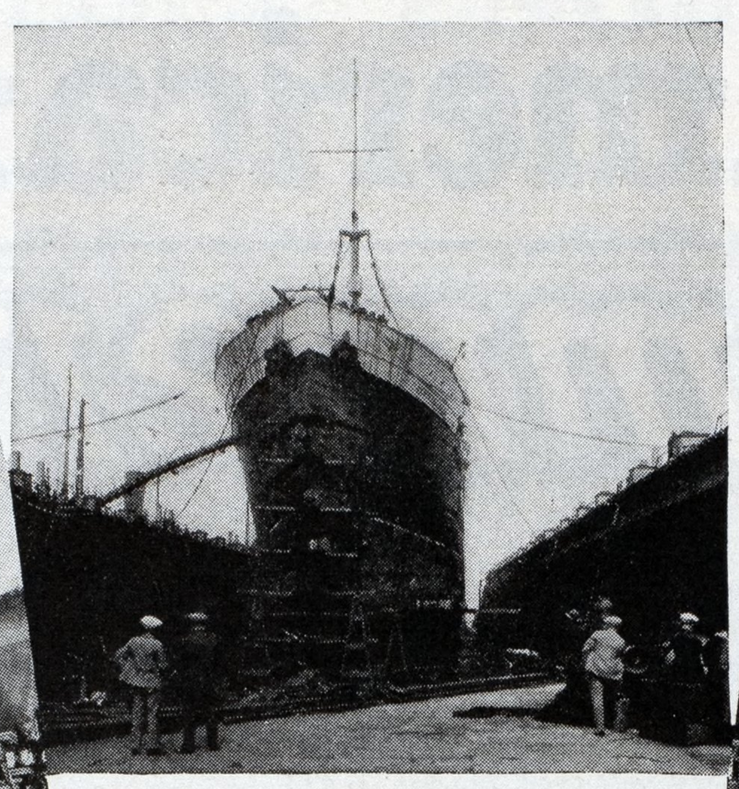
SOLD ON PERFORMANCE

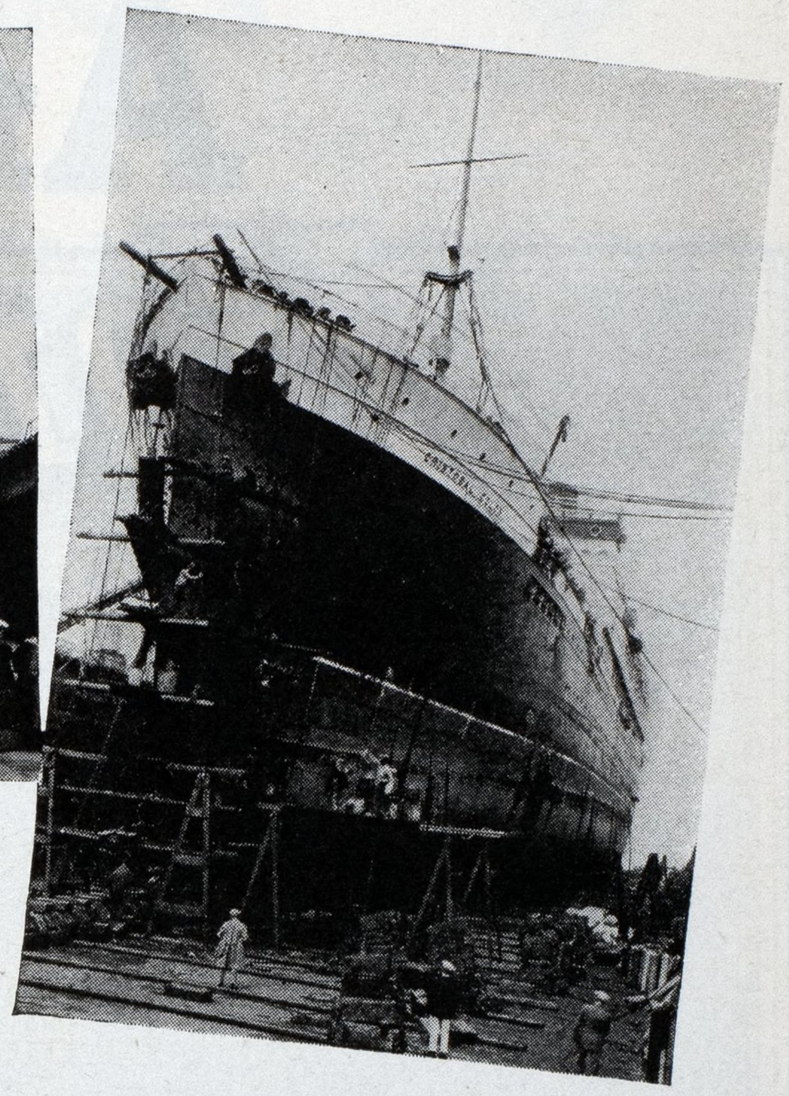
SHIPS COLLIDE IN FOG!

QUICK REPAIRS

While Passengers Remain on Board







Taking care of unexpected happenings which require quick service on a large scale is made easy by the tremendous facilities and vast resources at our command.

PASSENGERS LIVE ON LINER IN BROOKLYN DRYDOCK

Cristobal Colon Damaged by Collision; Sails Thursday

The thousand odd passengers who left Mexico and Cuba for Spain aboard the Spanish Royal Mail liner Cristobal Colon are now undergoing the unusual experience of living aboard a ship out of water, for this big liner is now propped up in a drydock at the Morse plant, United Dry Docks, Inc., in Brooklyn undergoing repairs for the damage sustained when the vessel rammed the British freighter River Orentes while both were groping their way through a thick fog in the harbor.

A majority of the passengers aboard the Cristobal Colon are whiling away their time watching the workmen of the shipyard rushing the repairs of the ship. Many of the first and second class passengers who are permitted ashore pass the daylight hours on sight-seeing trips in and around New York.

The Cristobal Colon is expected to resume her interrupted voyage for Spain this Thursday.

Unequalled Emergency Service

The UNITED organization, with six large shipyards at your service, is exceptionally well equipped for any emergency.

TWENTY-SEVEN Dry Docks!

United Dry Docks, Inc., operates, under one management, the shipyards (including a total of 27 dry docks) formerly owned by

Theo. A. Crane's Sons Company, W. & A. Fletcher Company, Morse Dry Dock & Repair Company, New York Harbor Dry Dock Co., Inc., James Shewan & Sons Company, Inc., Staten Island Shipbuilding Company.

Prompt Efficient Service

UNITED DRY DOCKS

Incorporated

11 Broadway **New York**

Among the leading motorships the "Sun" is also equipped with

American Hammered Piston Rings



The motorship "Sun" used in ocean service is driven by a 3000 H. P. Sun-Doxford engine equipped with American Hammered Piston Rings.

It was built by Sun Shipbuilding & Dry Dock Co. at Chester, Pa.



The American Hammered Piston Ring Co., Baltimore, Md.

New York Marine Branch, 11 Moore St., New York, N. Y.

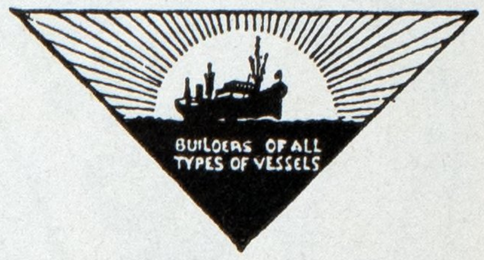
Pacific Coast Marine Branches, 215 Market Street, San Francisco, Cal. 501 Pico St., Long Beach, Cal.

SUN SHIPBUILDING & DRY DOCK COMPANY

Builders of

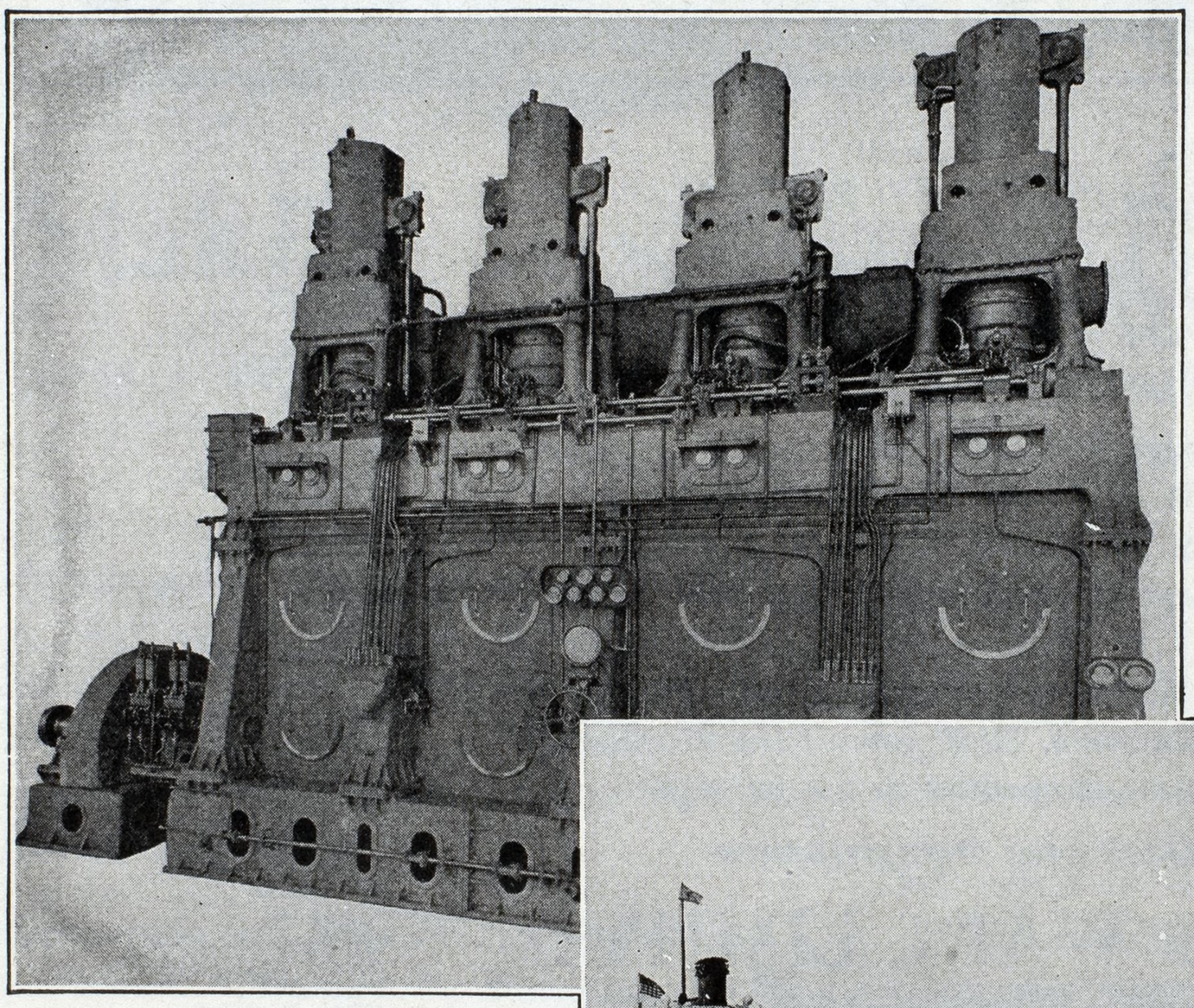


SUN-DOXFORD DIESEL ENGINES

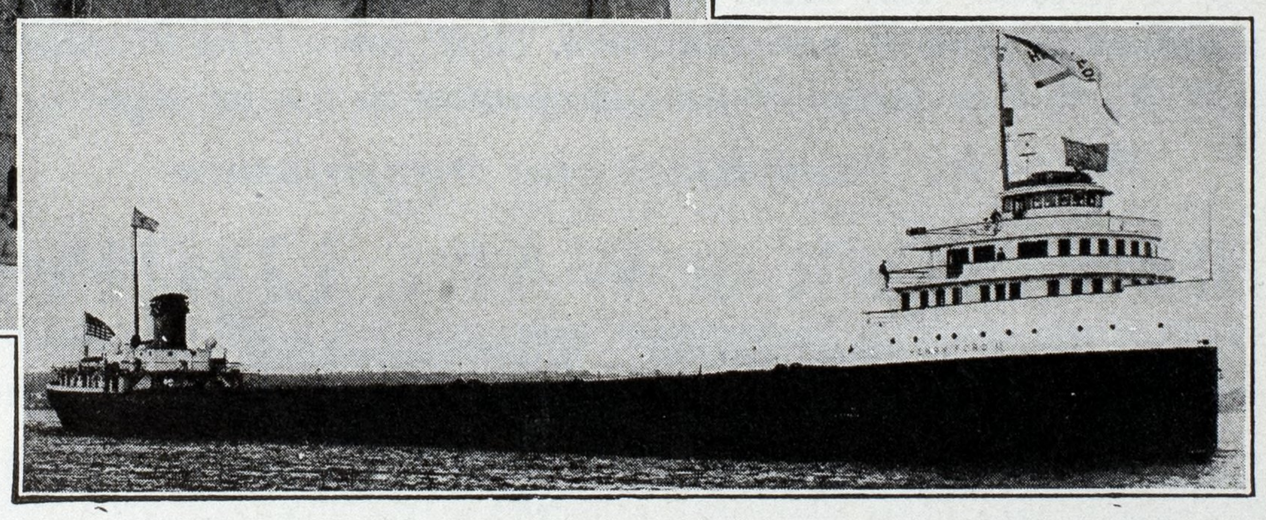


The Engines that Power

"HENRY FORD II" *and* "BENSON FORD"



3000 S. H. P. Sun-Doxford Diesel Engines power the two motorships, "Henry Ford II" and "Benson Ford".



M. S. "Henry Ford II"

SUN-DOXFORD *and* JUNKERS PATENTS

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Chester, Pa. - U. S. A.

Philadelphia Office:
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New York Office:
Cunard Building



Twin Screw Dieseltanker "Christian", built and engined 1927 by Burmeister & Wain, Ltd., Copenhagen. 470 ft. x 64 ft. x 35 ft. 12,700 tons d. w.

The B. W. Diesel Engine for propulsion of Tankers

A constantly increasing part of the World's fleet of Tankers is powered with the original B. & W. Marine Diesel engine.

The reason why the B. & W. Diesel engine is chosen is its established record for efficiency, reliability and short overhaul in port.

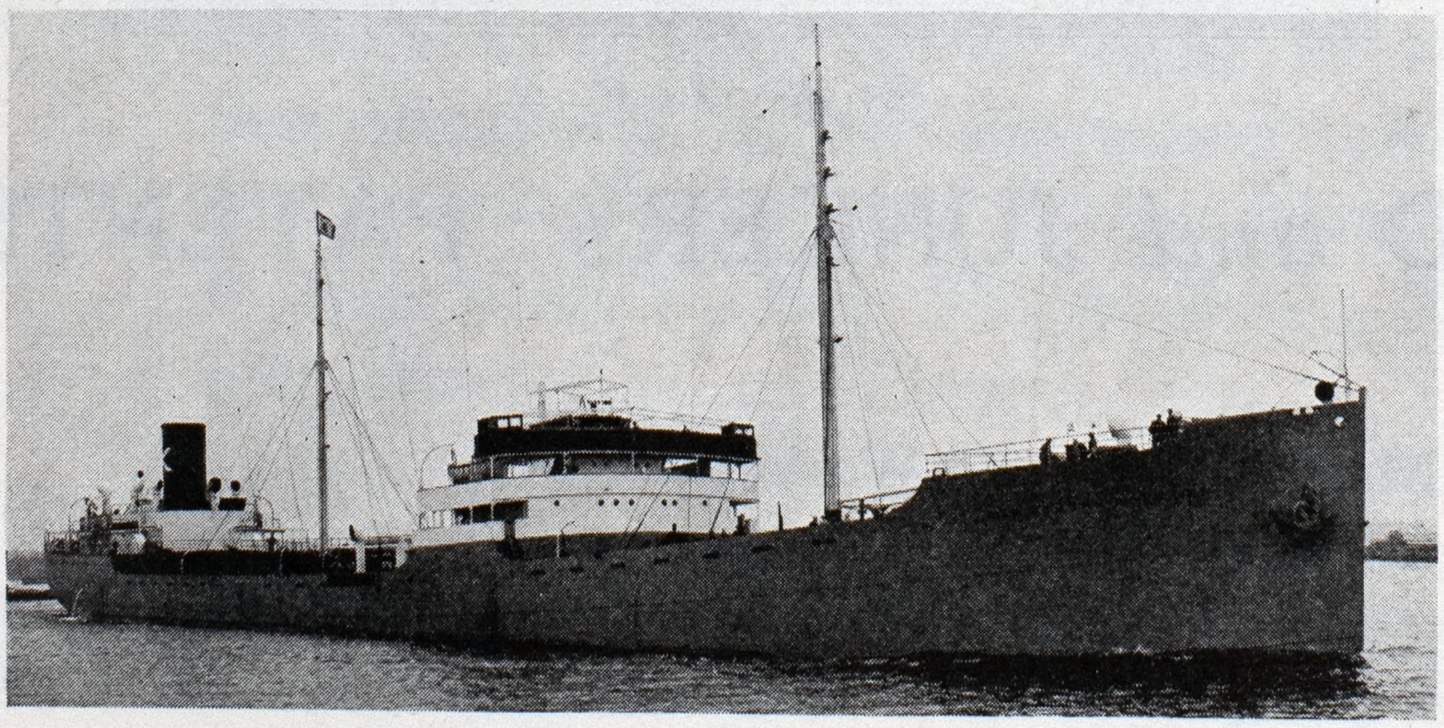
Up to October 1st, 1928, 63 tankers representing more than half a million tons d. w. and 190,000 I. H. P. have been fitted with the B. & W. Marine Diesel Engine, according to list on right.

Write for Pamphlets and Information

BURMEISTER & WAIN, LIMITED

Copenhagen, Denmark

U. S. Representative: H. C. Hallings, 27 Whitehall Street, New York City



Twin Screw Dieseltanker "Sir Osborn Holmden", built and engined 1928 by Burmeister & Wain, Ltd., Copenhagen. 488 ft. 6" x 64 ft. 2" x 35 ft. 13,000 tons d. w.

	Name of ship	D. W.
	Abadan	9000
	Agatha	3600
	Alynbank	8970
	Anna Maersk	8110
	Athelchief	12800
	Athelprince	12800
	Benedick	10300
	Bianca	8300
	Birchbank	8970
	British Courage	10000
	British Faith	10000
	British Hope	10000
	British Reliance	10000
	Britta	9000
	Cedarbank	8970
	Christian	12700
	Clydebank	8970
	Clydefield	9437
	Comliebank	8970
	Daghild	13000
	Dagland	9000
	Duivendrecht	8500
	El Aleto	10000
	Elmbank	8970
	Emma Maersk	12250
	Forresbank	8970
	Glenbank	8970
	Glittre	9000
	Gustaf E. Reuter	9000
	Hidlefjord	11050
	Hilda Knudsen	12800
	Ida Knudsen	12800
	Inverbank	8970
	Jane Maersk	11800
	Java	12800
	Julius Schindler	3950
	Kathiawar	6550
	Larchbank	8970
	Le Loing	6465
	Levernbank	8970
	Lincoln Ellsworth	7800
	Marie Maersk	12250
	Markland	9000
	Myrtlebank	8970
	Nairnbank	8970
	Nyholm	8265
	O. A. Knudsen	13000
	Oljaren	7700
	Orkanger	10540
	Ossag	3950
	Paua	1050
	Paula	2300
	Petronella	2300
	President Francqui	6500
	Raila	7900
	Rhea	11500
	Sir Osborn Holmden	13000
	Sliedrecht	6500
	Solstad	8170
	Storstad	13000
	Svolder	9000
	Varg	8206
*	Weirbank	8970



Making Good on a Hard Job

with Westinghouse Turbine Electric Drive

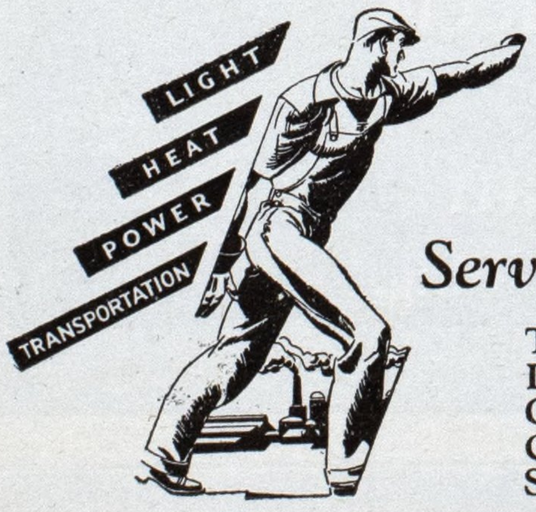
PUTTING out to sea to render assistance to storm-tossed vessels when most ships are hove to, or safely berthed in port, months of patrol far removed from bases of operation; such is the arduous service of the Coast Guard, which demands the best in equipment and personnel.

The five recently completed Coast Guard cutters, Chelan, Champlain, Pontchartrain, Mendota and Tahoe, have proved by their trials and shake-down cruises that they are admirably equipped for this exacting duty. Backed by an organization with years of experience in the successful design and manufacture of all classes of marine machinery, Westinghouse turbine electric drive was installed for these cutters.

The proof of the excellent performance of this machinery lies in the contract recently awarded for three new cutters, in which Westinghouse turbine electric propulsion is again specified.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.

SALES OFFICES IN ALL PRINCIPAL AMERICAN CITIES, SERVICE STATIONS IN ALL PRINCIPAL AMERICAN PORTS



Westinghouse

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Serves the Marine Industry with . .

Turbine Electric Propulsion
Diesel Electric Propulsion
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Condensers
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JOHN GREIG, Docking Foreman
110 Walnut St., River Rouge, Mich.....Cedar 5558-W
FRED ERNST, Supt. Machine Shops
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O. WOERFUL, Plant Supt.
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Shipbuilding and Repairing facilities unsurpassed in America



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3
LARGE
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DOCKS

Here ships are completely overhauled and refitted at the same time

RESOURCES, capacity, experience and facilities are found here in a combination which develops the highest efficiency in the building, converting and repairing of ships.

In the final analysis, it is the proven economy, consistently demonstrated in all classes of work which has placed this organization at the head of preferred shipyards.

Every detail of construction, inspection and test are performed with an accuracy and thoroughness that insure maximum ship safety and operating economy.

Marine Paints of Every Description Including Newport News Composition Anti-Corrosive and Anti-Fouling.

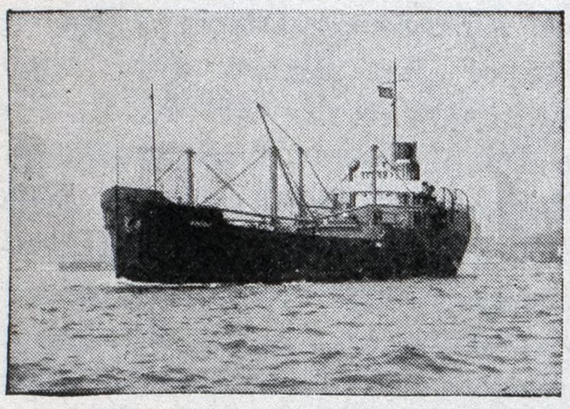
Newport News Shipbuilding and Drydock Co.

Newport News, Virginia *223 Broadway, New York City*

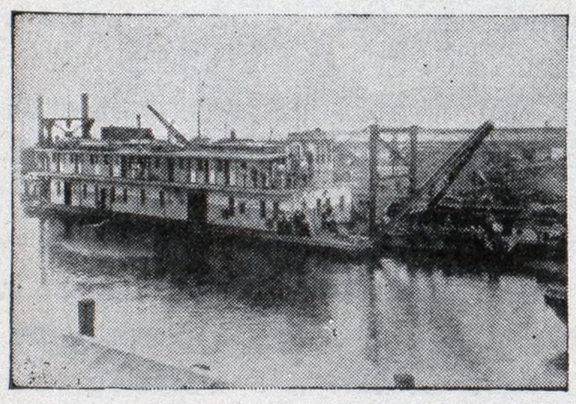
Different vessels but the one *oil* . . .

TEXACO URSA OIL

TEXACO

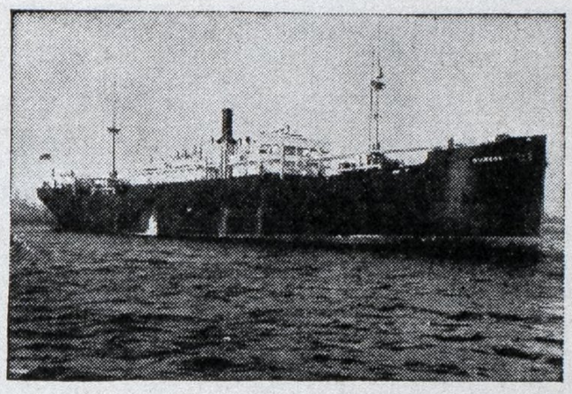


The M. S. Muncove of the Munson Line Equipped with 4-cycle, 6-cylinder McIntosh and Seymour Diesel Engine of 925 S.H.P. Lubricated since 1923 with Texaco Ursa Oil.

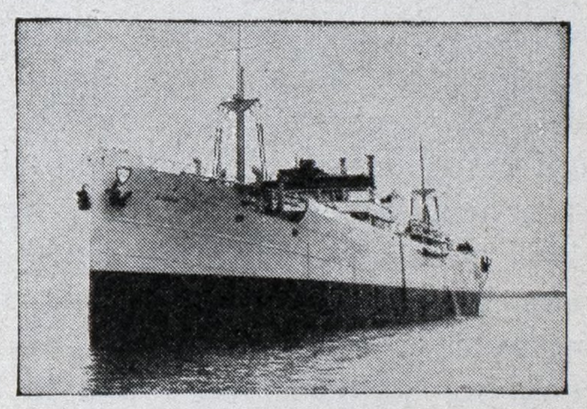


The United States Engineers Diesel Dredge Pullen with two Winton Diesel Engines, one of 500 H.P. and one of 225 H.P. Lubricated since 1926 with Texaco Ursa Oil.

IT WAS the promise of superior Diesel lubrication that placed Texaco Ursa Oil aboard these vessels. The unmistakable proof of superior lubrication keeps it there. Texaco Ursa Oil in these different types of motor ships, in different services and with different makes of engines has for years been accepted as the *one* oil for Diesel lubrication. These vessels are but a few of the great fleet of Texaco lubricated motor ships in all parts of the world. Texaco Ursa Oil has *all* the qualities of a perfect Diesel lubricant—*and a low carbon residue that is absolutely exceptional.* Write The Texas Company—Texaco Marine Lubrication Service extends to the principal ports of the world.



The M. S. Wilscox operated by the American Republic Line between North Atlantic ports and the East Coast of South America. The two-cycle, double acting Nelseco M. A. N. Diesel lubricated by Texaco Ursa Oil.



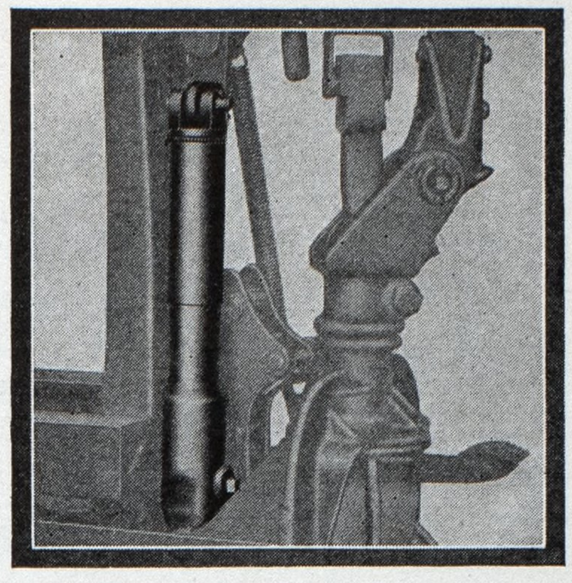
Motor Vessel Bronnoy owned by Borgestad A/B (Gunnar Knudsen), Porsgrund, Norway. The 2800 I. N. P. Burmeister & Wain Diesel Engine lubricated by Texaco Ursa Oil.

TEXACO LUBRICANTS

THE TEXAS COMPANY
Marine Sales Division
17 Battery Place, New York City
Offices in Principal Cities

SHOWN *at the right is a close-up view of the Lewis-Shepard Vertical Release Check. Every owner of a Lewis-Shepard Jacklift knows positively that his loads will always descend smoothly and easily regardless of their weight. No shock or jar to damage the load or the lift truck.*

The Vertical Release Check works on the principle of oil compression; it requires no stuffing-box. Note how its position on the Jacklift protects it from injury. The Lewis-Shepard Jacklift is the only lift truck with this vertical release check advantage.



For Marine Shipping Work

the Jacklift is the Master Lift Truck Saves 20% to 70% and More of Your Handling Costs

Consider these points of superiority: They make the Jacklift "the" lift truck for Marine Shipping Work.

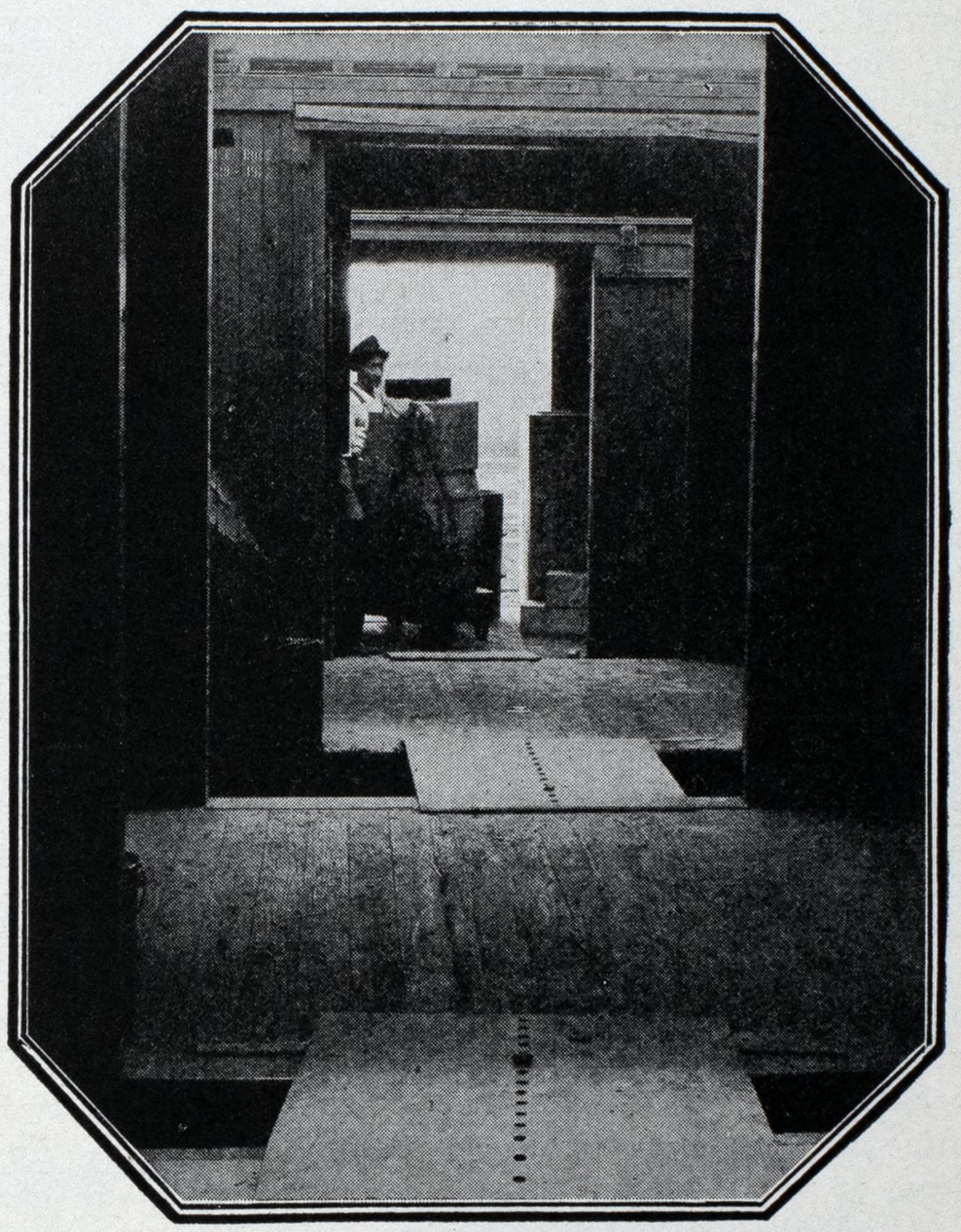
1. The Jacklift lifts and lowers loads vertically—allowing close piling by accurate spotting.

2. The Jacklift can elevate a load with the handle at any angle within an arc of 270°—stanchions and posts cannot corner a Jacklift—cramped quarters and narrow aisles don't count.

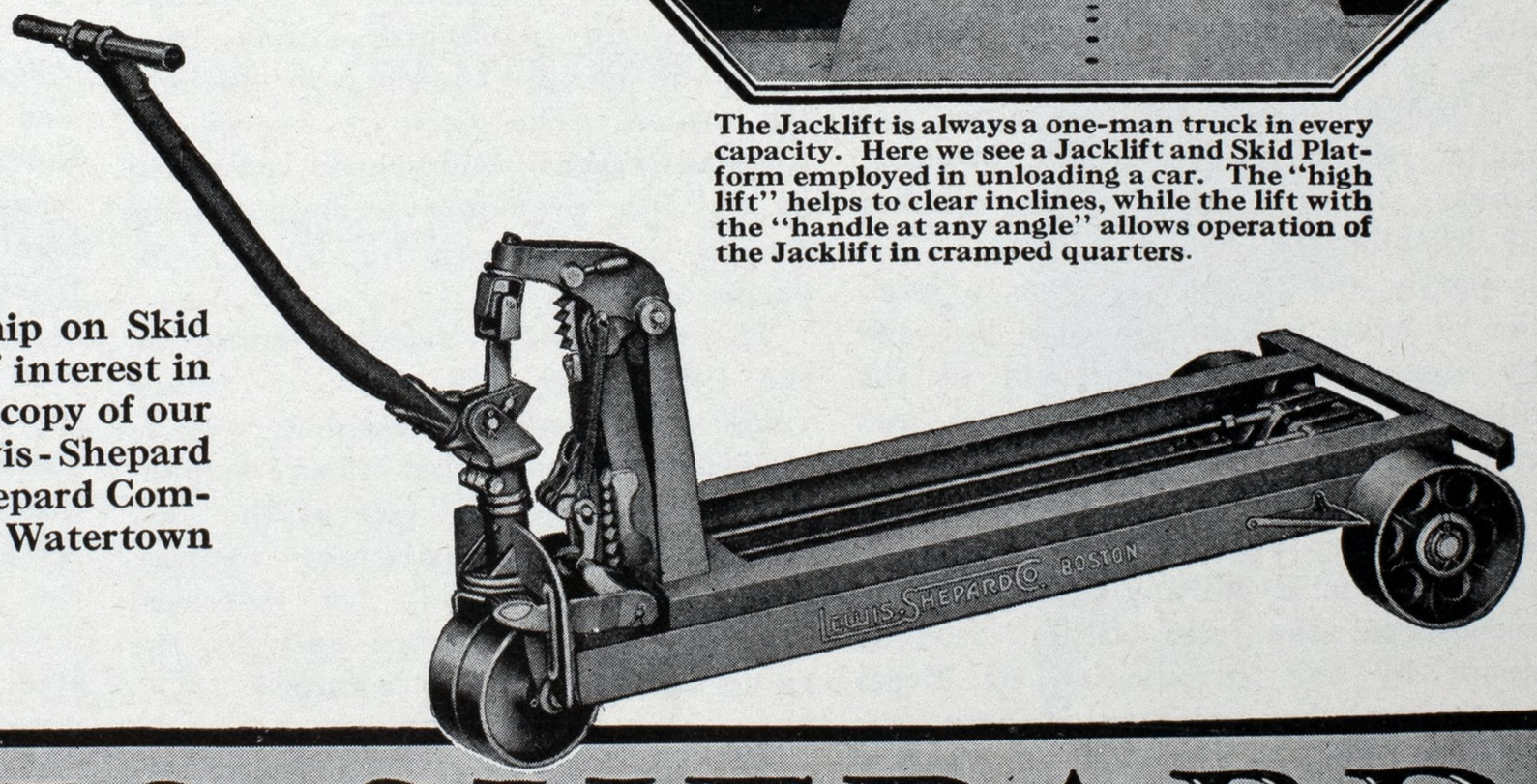
3. The Jacklift is especially noted for its high lift; it allows ample clearance for skid platforms over ramps or gangways.

4. The Jacklift has an Easy Lift—a different ratio is applied to each capacity truck—an easy pull elevates any load whether of one ton or five tons.—No strain on the operator.

5. Safety—The Jacklift Handle is always engaged with the load—the operator cannot possibly pull on an "empty" handle and fall over backward.



The Jacklift is always a one-man truck in every capacity. Here we see a Jacklift and Skid Platform employed in unloading a car. The "high lift" helps to clear inclines, while the lift with the "handle at any angle" allows operation of the Jacklift in cramped quarters.

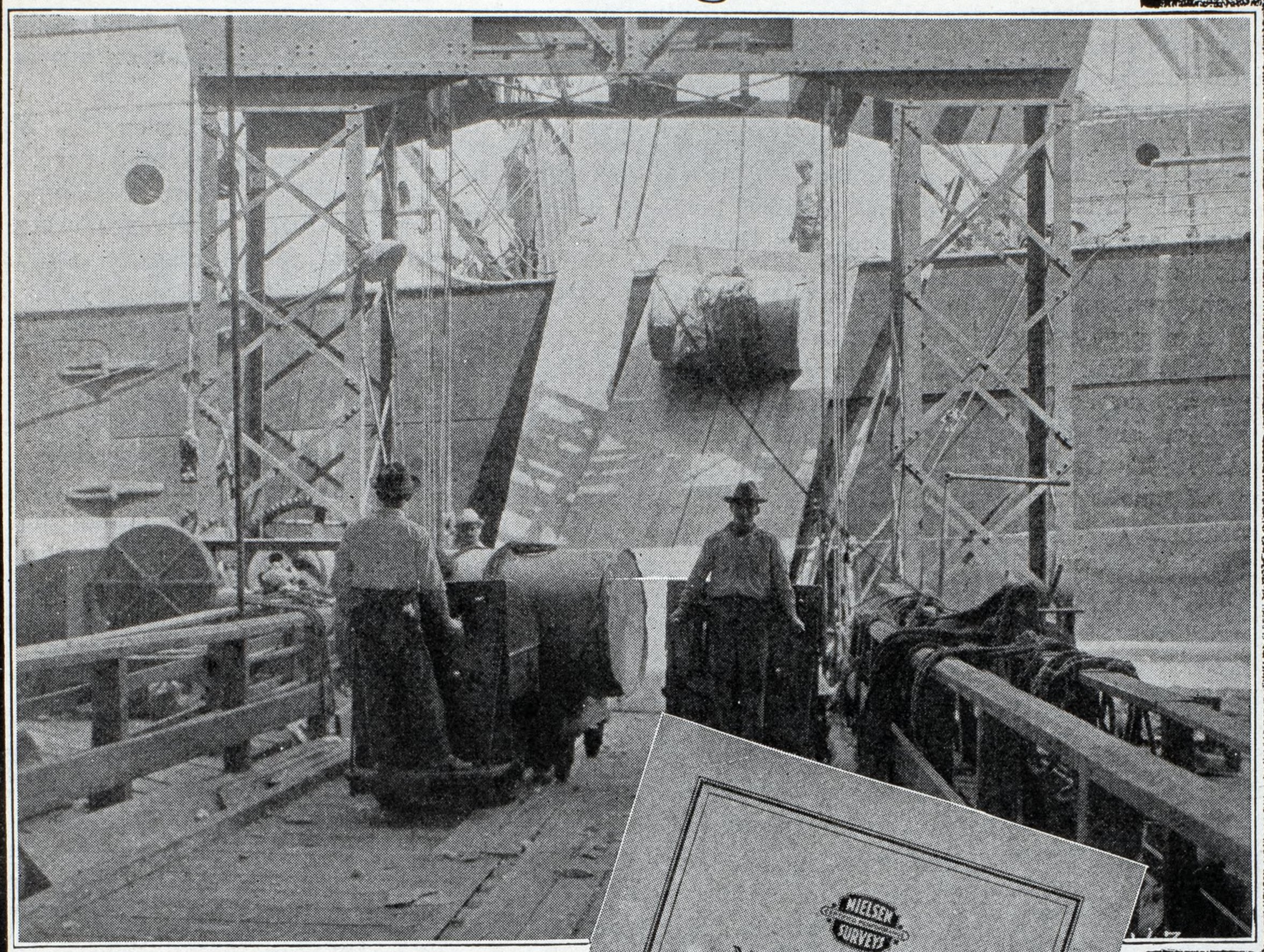


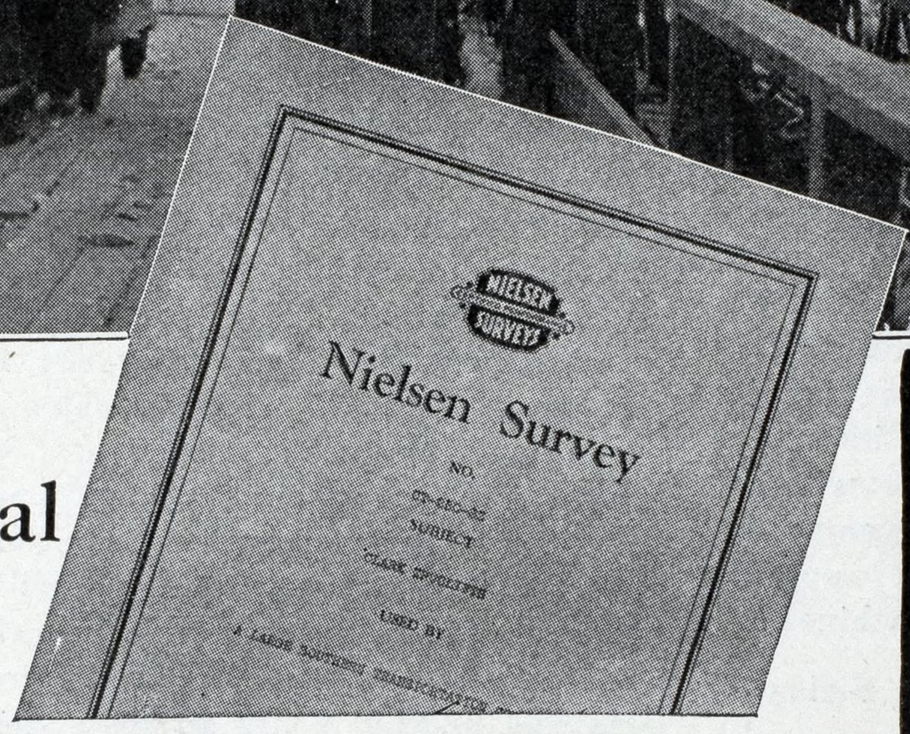
Let us send you "Ship on Skid Platforms," a circular of interest in Shipping circles, and a copy of our revised catalog, "Lewis-Shepard Engineering," Lewis-Shepard Company, 170 Walnut Street, Watertown Station, Boston, Mass.

LEWIS-SHEPARD

Many Large Manufacturers are Shipping their Goods on Lewis-Shepard Skid Platforms

"All Ashore That's Going Ashore"





Rapid, Economical *Stevedoring by Truclifts* means Prompt Sailings and Full Cargoes

Truclifts can work all day and all night when sailings are delayed and cargo must go aboard racing against time,—against the old warning cry, "All Ashore!" But it is the common experience of transportation companies using the Clark Truclift system that such rushes are unlikely to occur when stevedoring is regularly and consistently on such an efficient basis.

Elimination of re-handling by skids picked up on Clark Truclifts speeds up work. However, this is not all; costs are reduced in proportion. Engineering surveys of installations where handling speed has been increased at a fraction of the operating cost are available. The coupon will bring you copies.

CLARK CLARK TRUCTRACTOR CO.
Battle Creek, Mich.

TRUCTRACTORS
Reg. U. S. Pat. Office

Send the Coupon

Clark Tructractor Co.,
Battle Creek, Mich.

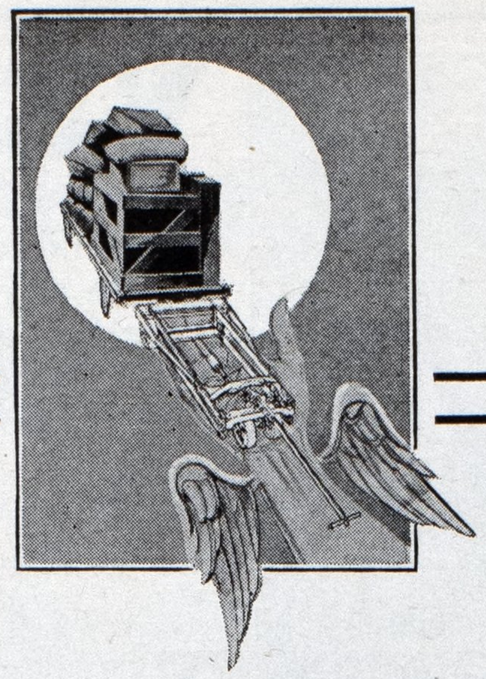
Please Send Nielsen Survey of Truclift installations.

Name .....

Company .....

Address .....

MR-6-29



says

The Live Wire Steamship Companies *to* The Railroad Companies:

"Why don't you too employ the Shipping on Skid System or Operation for the handling of your merchandise and thereby eliminate that continual rehandling with its excessive loss, delay, damage to merchandise, etc., etc. Many Railroads are doing it and doing it at a saving. We are equipped to handle Skid Shipments."

says

The Live Wire Railroad *to* The Shipper:

"We have the facilities for delivering and handling Skid Platform Shipments. It saves rehandling—is quicker—avoids loss and damage. Look into this modern method. Ship your goods to us on Skid Platforms."

says

Stuebing COWAN

The Lift Truck-Skid Platform Folks

Cincinnati, O. and Holyoke, Mass

"We have a size and type of lift truck (made like a machine tool) with absolute safety features—the lift truck which is being used all over the world. Each a masterpiece—each possessing exclusive features."

Demand a Stuebing Cowan.

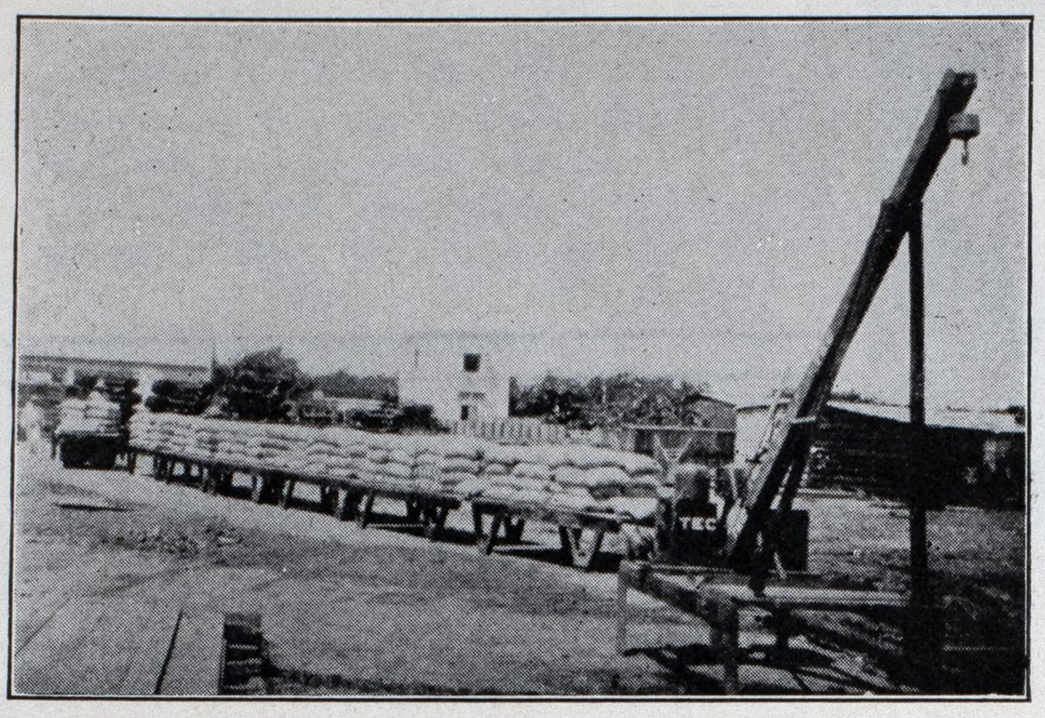
Ask **LEEDS, TOZZER *and* COMPANY *Inc.***

75 WEST ST.

NEW YORK, N.Y.

America should ship its goods on skid platforms

W. Stuebing



The one complete system of mechanical freight handling for marine terminals.

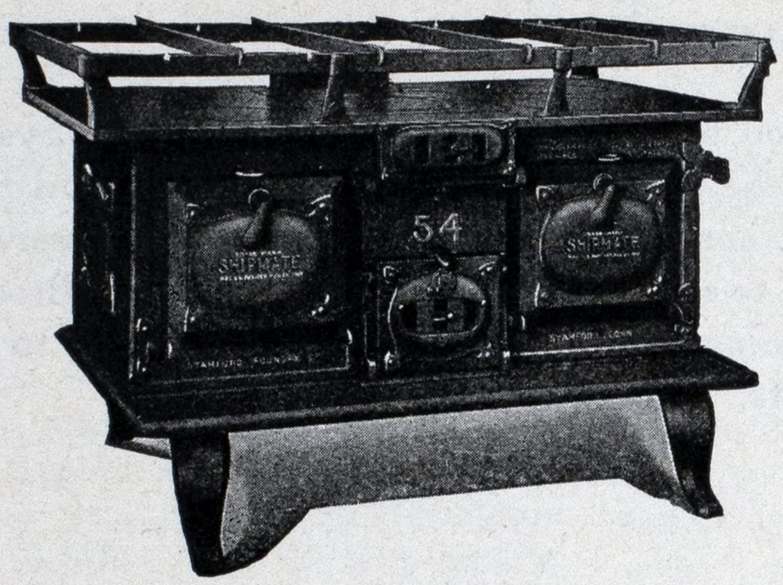
VERSATILITY

Terminal operation requires machinery which can handle any class of freight and change quickly from one class to another. Note operation at Barranquilla, South America, where native labor is cheap,— yet TEC equipment paid for itself in three months.

Either lift bodies or crane attachment used interchangeably with the same TEC Truck.

Terminal Engineering Co.

17 Battery Place, New York, N. Y.



"As good as SHIPMATE"

When anyone offers you a range and says "It is as good as a SHIPMATE" isn't that the highest recommendation the SHIPMATE can have? Doesn't that statement show that the SHIPMATE is the standard by which other ranges are judged?

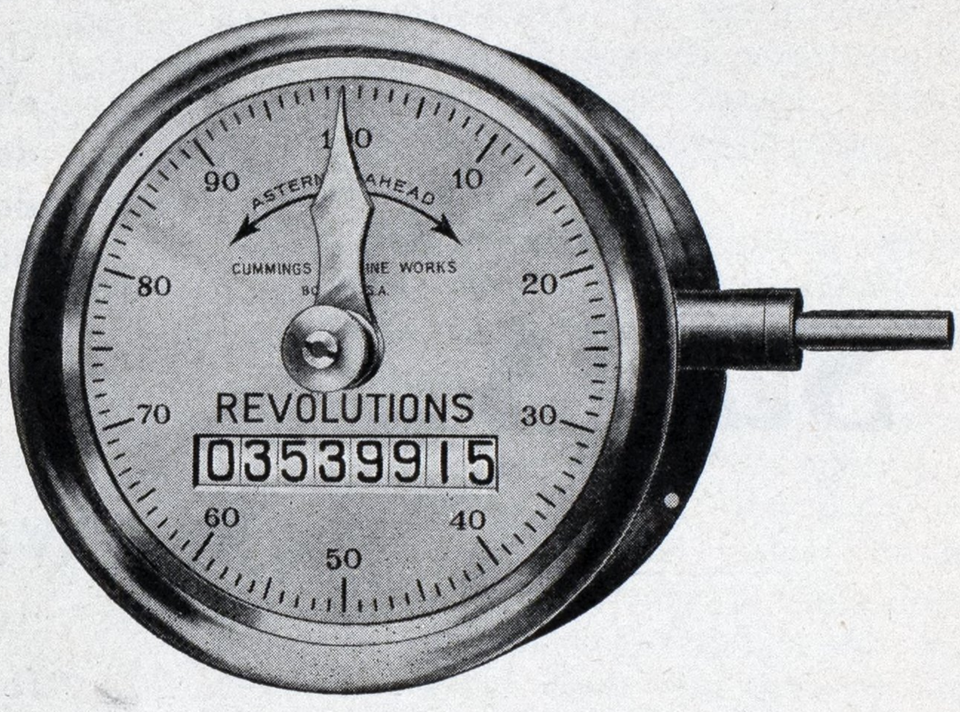
SHIPMATES are made only by

THE STAMFORD FOUNDRY COMPANY

Established 1830 **Stamford, Conn.**

Cummings

Combination Counter & Telltale



Adopted by the Panama Pacific Line on
S. S. California
S. S. Virginia
S. S. Pennsylvania

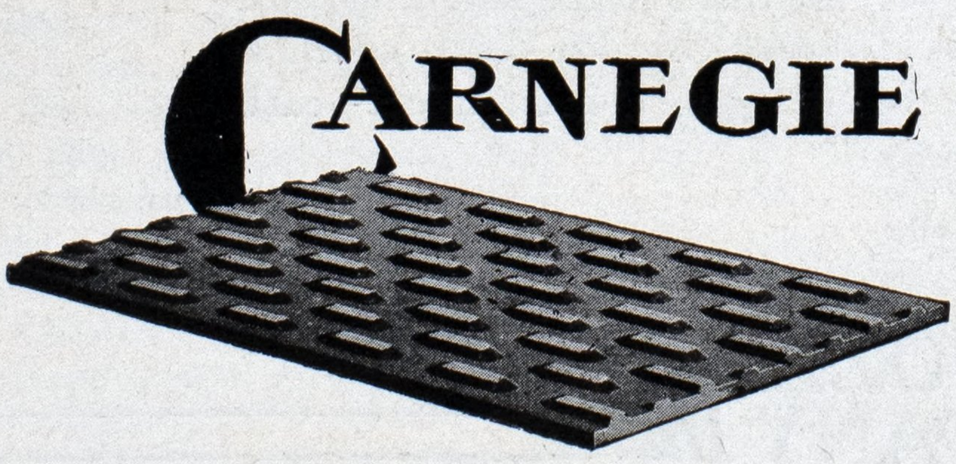
Cummings Revolution Counters and Gary-Cummings Torsion Meters

have been used on
U. S. Naval Vessels Since 1912

Cummings Machine Works

255 Atlantic Ave., Boston, Mass.

CARNEGIE FLOOR PLATE



Section M-41
Thickness—$\frac{3}{16}$" to $\frac{3}{4}$" exclusive of raised figure.
Width —6" to 66".
Weight —8.8 to 31.7 pounds per square foot.

Recommended for floors, sidewalk openings, stair and traffic treads, where a safe, secure foothold is required. This design drains and cleans easily.

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION
CARNEGIE BUILDING, PITTSBURGH, PA.

▼▼▼ SKID-SHIPPING Pays not only shipper and consignee but also the CARRIER!

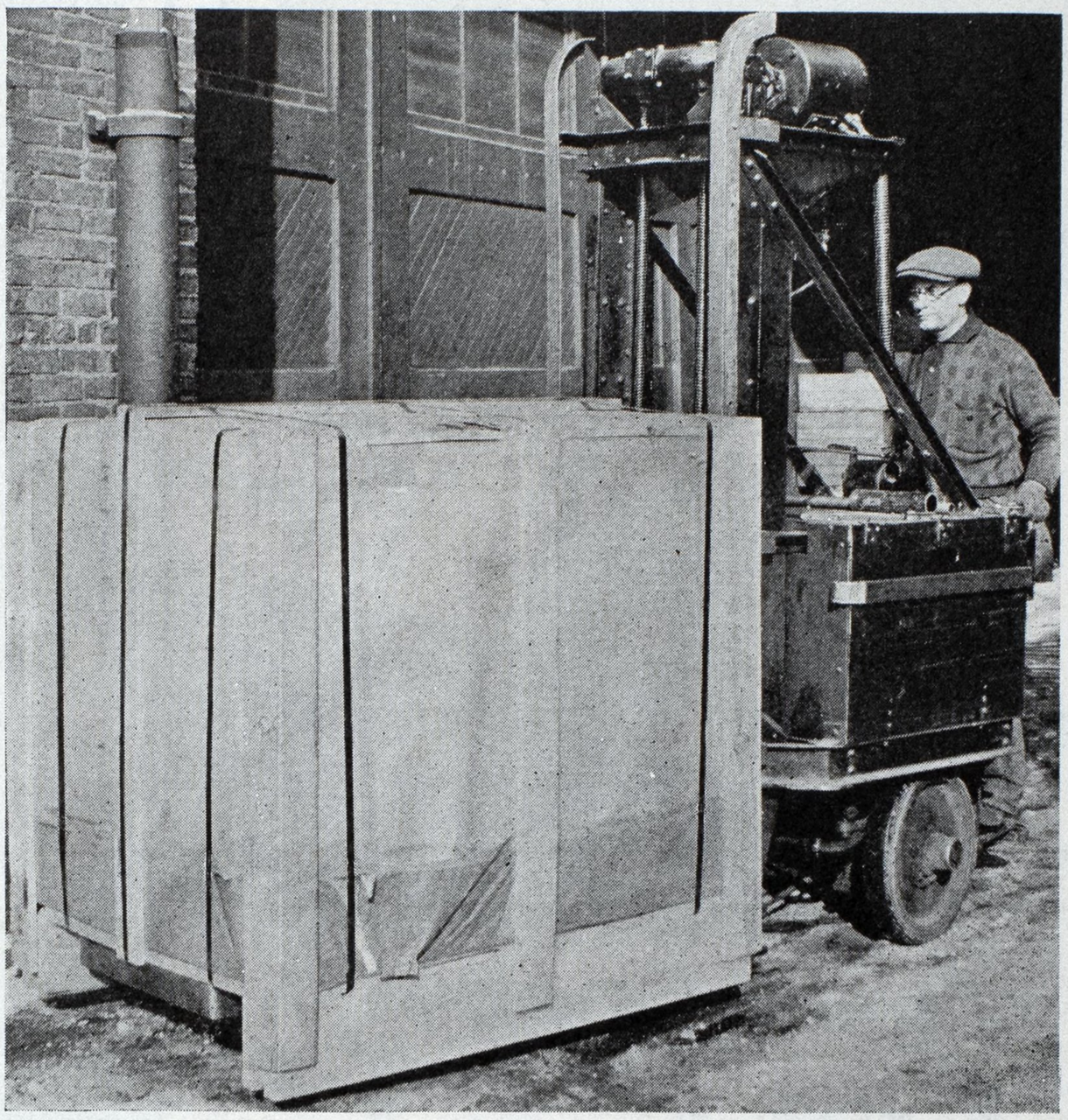
RECOMMEND to your shippers this authentic and approved *Acme method* of securing loads on skids. Not only does it offer tremendous advantages to those who ship and those who receive merchandise, but makes so much more rapid and easy *your handling* of many kinds of materials.

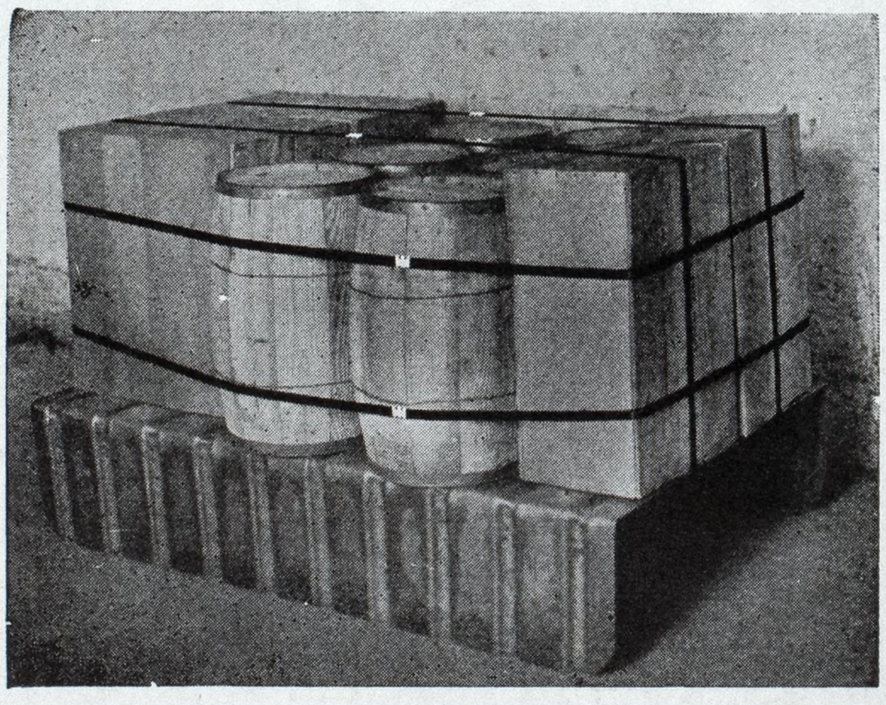
The Acme Nailless Band method may be applied equally well to nearly all types of loads—quickly, easily and securely.

Special Acme Tools are available for stretching and sealing this specially tempered, non-stretch steel band, which tests 85,000 pounds per square inch tensile strength.

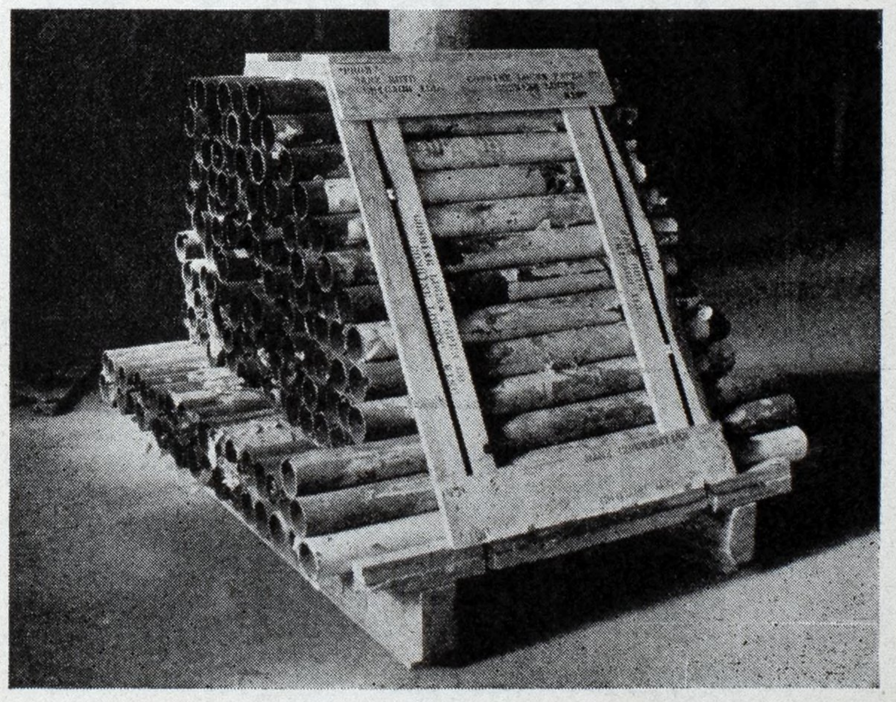
You are welcome to call on Acme Engineers for suggestions and co-operation in working out more satisfactory shipping methods for your patrons.

Write us if you have any problems along this line.





Mixed load of boxes and kegs strapped to a pressed steel platform for shipment. There is no chance for any part of this shipment going astray.

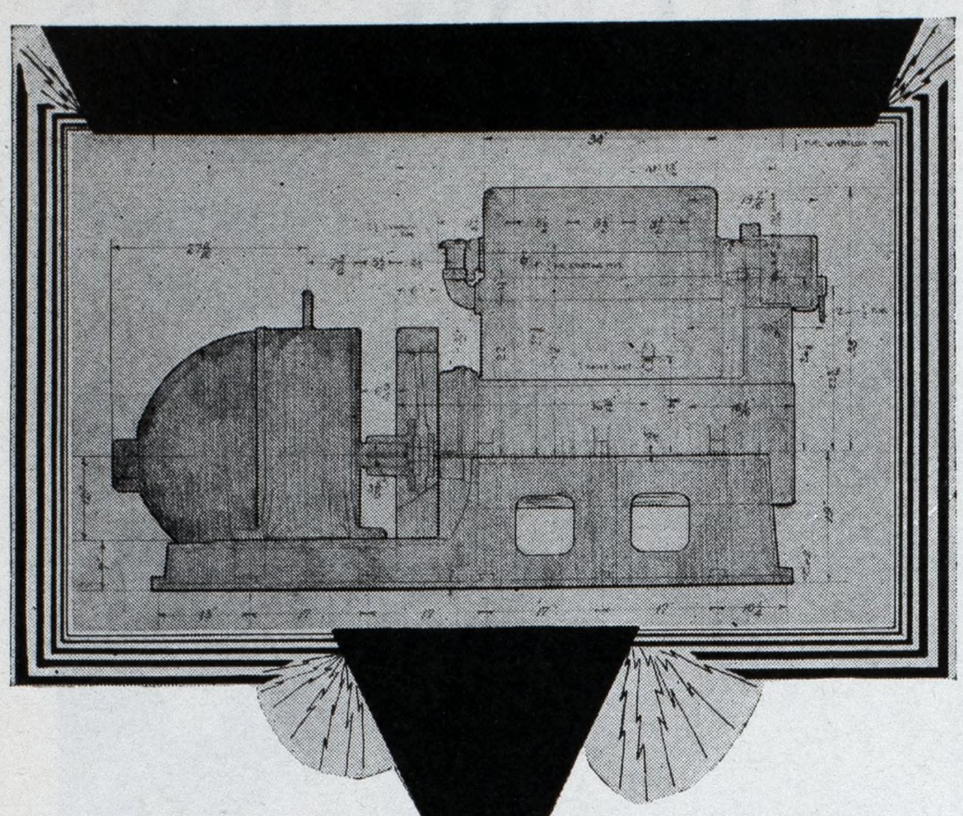


Iron cores from rolls of rotogravure paper strapped to wooden skid for return shipment to the paper mill. Weight 3600 pounds—one handling and one shipping label, instead of 150.

ACME STEEL COMPANY

2840 Archer Avenue, Chicago, Ill.

DIESEL DRIVEN GENERATING SETS



GET OUR QUOTATION.
IT WILL PAY YOU.

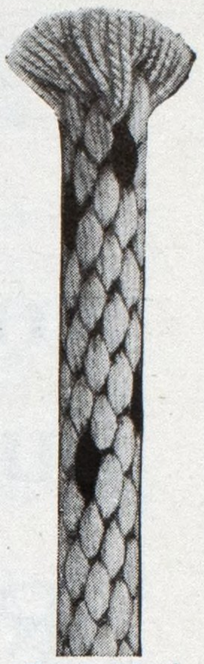
Let us quote on all types of
Diesel-driven auxiliaries

WRITE

STANDARD MOTOR CONSTRUCTION CO.

184 Whiton St. Jersey City, N. J.

SAMSON SPOT
Log Lines



Trade Mark Reg. U.S. Pat. Off.

Smooth, tough and durable; no adulterating material to stiffen it and decrease strength and durability. Solid braided of extra quality cotton yarn. Uniform in size and quality. Easily identified by the colored spots, our trade mark.

We also manufacture flag halyards, lead lines, tiller rope; solid braided cotton cord in all sizes for various marine uses. Ask for catalog and samples.



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88 BROAD STREET BOSTON, MASS.

TRADE MARK

The name "Welin" on

Lifeboats
Rafts
Davits

is known the World Over

Welin Lifesaving
Equipment is
Standard Wher-
ever Ships Sail

WELIN DAVIT & BOAT CORPORATION

305 Vernon Avenue

Long Island City, New York

Agents—Upson-Walton Co., Cleveland, O.
C. V. Lane, Balfour Bldg., San Francisco, Cal.

DIXON'S
Flake Graphite

Recognized the world over as the standard lubricating graphite. Used alone, or as an auxiliary lubricant with oils and greases, Dixon's Flake Graphite materially increases the operating efficiency of every machine it is used on.

Even tho Dixon's Flake Graphite has been used by thousands of mechanics, maintenance men and engineers for more than 100 years—do you know the . . . how . . . and . . . why . . . of Dixon's Flake Graphite lubrication?

Joseph Dixon Crucible Co.
Jersey City, N. J.



COMRADES *of* PROGRESS



Mercury
Trackless Train

Have This Book

How Others Have Reduced Terminal Handling Costs

Every official interested in lowering handling costs on the docks can profit from this book. It records the results of cost reduction effort in 40 terminals. Terminal superintendents themselves wrote it. All conditions of operations are included and the remedies shown. Comparative costs are given.

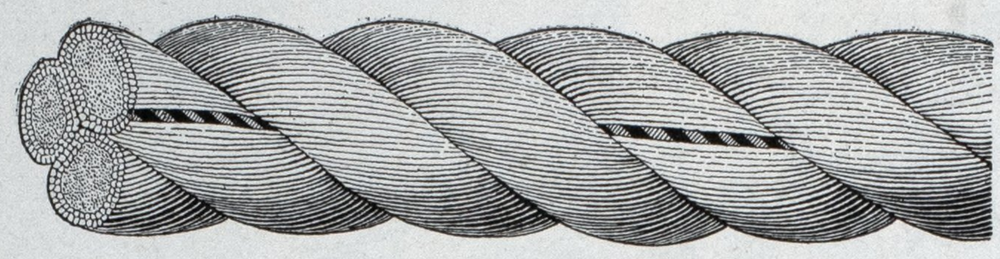
Copies of this book will be gladly sent on request. Have your secretary write for yours today, that tomorrow you may have the data on the Bush Terminal Company before you.

Mercury Manufacturing Company
4160 South Halsted St.
Chicago, Ill.

Canadian Representatives,
Laurie Machinery Co., Ltd.
Insurance Exchange Bldg.
Montreal, Canada

FIBORE
(FIBRE CORE)
MANILA ROPE

Patented June 23, 1925; Oct. 20, 1925; Aug. 3, 1926



Look for the Orange and Black "Twinyarn" Marker

MADE water-resisting by our patented WATERFLEX process, FIBORE is unquestionably the strongest and most efficient type of large cordage ever developed; it remains flexible at all times, and is easy to handle and splice—*wet or dry*.

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Factory and Warehouses
Jersey City, N. J.

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Branches
Chicago, Boston, Kansas City *and* Houston

DEAN BROS.
MARINE PUMPS

"The Dean of Pumps on Land and Sea"

Single Style & Duplex
Piston Type & Plunger

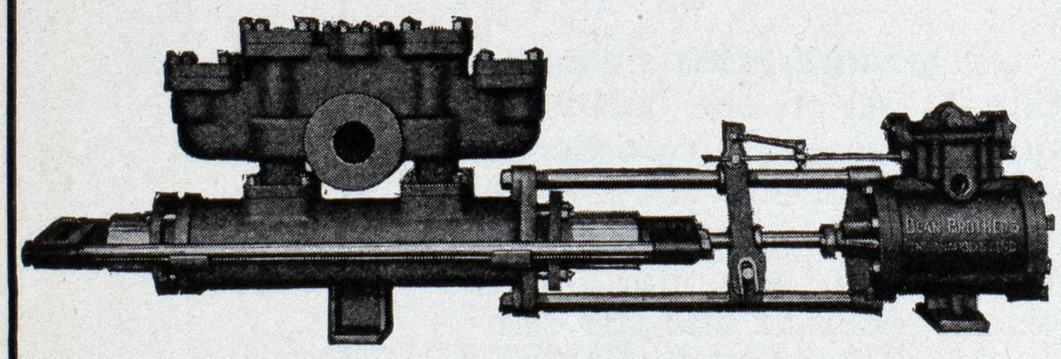


Figure No. 2311 Horizontal Single Style Double Acting Outside End Packed Plunger Trombone Pot Valve Pump For Boiler Feed & Pressure Service.

ESTABLISHED 1869

DEAN BROS. COMPANY

MANUFACTURERS OF PUMPING MACHINERY FOR ALL PURPOSES

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INDIANAPOLIS IND.



For the dining salons of
S. S. Virginia
S. S. Pennsylvania
S. S. California
we designed and built more than 1000 of these beautiful chairs.

PROPERLY DESIGNED CHAIRS

"M & S Chairs are designed for comfort and built to last"

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New York Office
152 W. 42nd St.

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SOME PROMINENT I-R INSTALLATIONS

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Martha Foss
Van Dyke I
Van Dyke II
Van Dyke III
New York Central 34
New York Central 22



DIESELS ARE WINNING ORDERS ON PERFORMANCE ALONE

Diesel engines, in the span of a few years, have been replacing steam in all types of craft. This is not surprising, for performance records are beginning to show that the Diesel engine is the most economical prime mover the marine world has ever known.

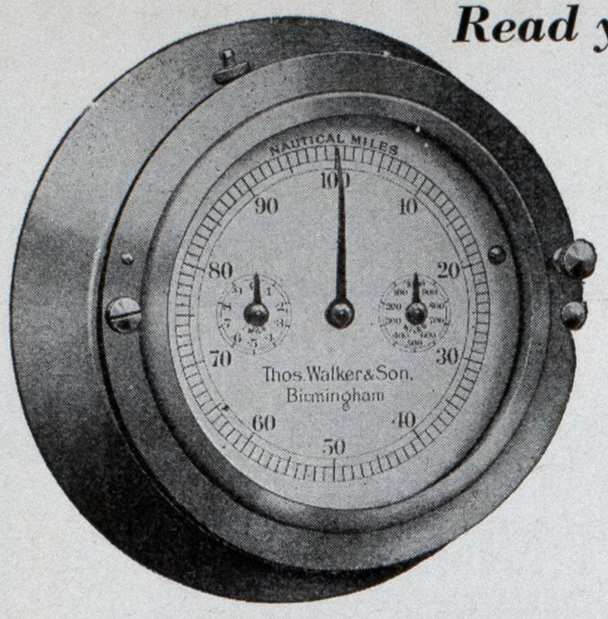
Ingersoll-Rand solid-injection Diesel engines are making notable records for economy and reliability. One owner writes as follows: "From the standpoint of starting, reliability, power, lack of wear, and all-around general efficiency, we do not know of any other engine that has made a better record."

INGERSOLL-RAND COMPANY
11 Broadway - - New York City

Branches or distributors in principal cities the world over
For Canada Refer—Canadian Ingersoll-Rand Co., Limited
10 Phillips Square, Montreal, Quebec

74-MOE

Ingersoll-Rand



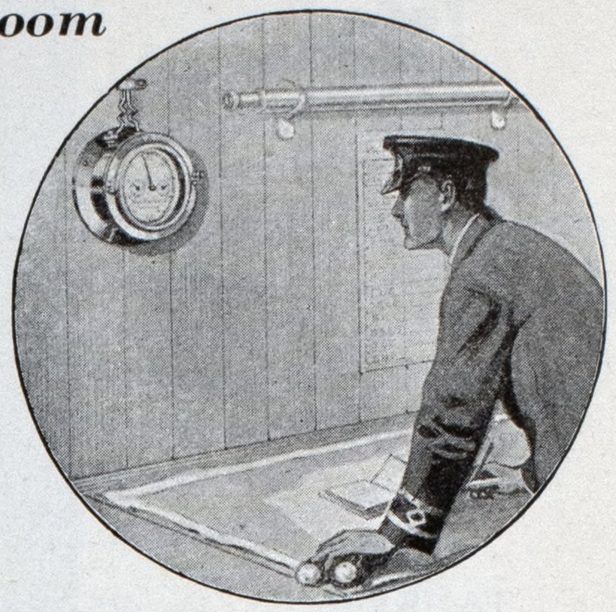
Read your Distance Run in the Chart Room where you USE the reading!

WALKER'S "TRIDENT" ELECTRIC SHIP-LOG

"The recording clock being over the chart is of great use, especially at night" one Captain writes.

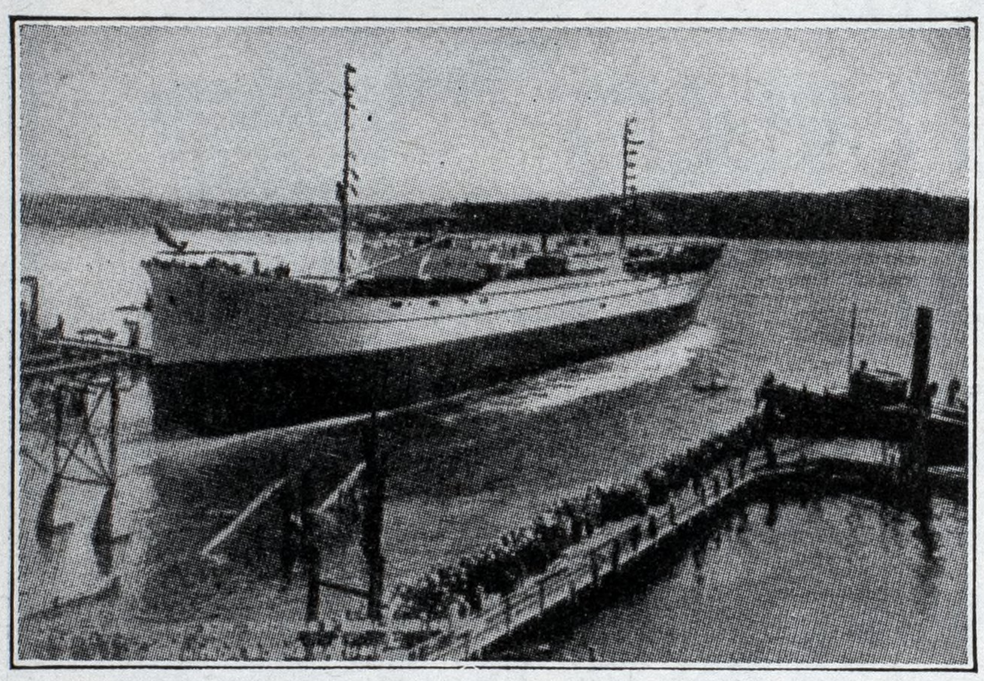
Obtainable of Nautical Instrument Dealers everywhere.

Thos. Walker & Son, Ltd.,
58 Oxford Street, Birmingham, Eng.



BATH IRON WORKS

Launching 425 ft. steel Steamship



Years of experience in design and building water craft, have won for Bath Iron Works an enviable reputation. Sound materials straight thru, expert designing, conscientious workmanship—these are features of every vessel that leaves the docks of the Bath Iron Works.

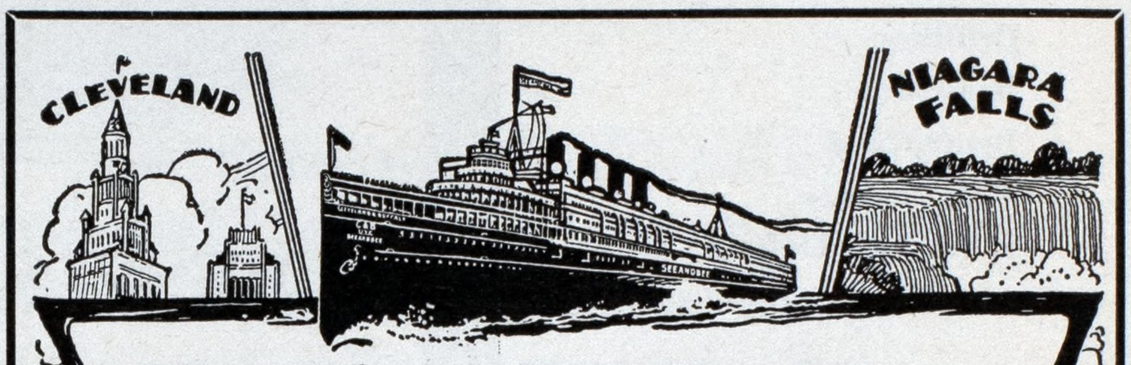
— -I- —

Inquiries Solicited

BATH IRON WORKS CORP.

SHIPBUILDERS AND ENGINEERS

BATH, MAINE, U. S. A.



Traveling East *or* West

Enjoy a restful night on Lake Erie on board one of the palatial

C & B Line Steamers

Beautiful scenery. Comfortable staterooms, luxurious cabins, wide decks, excellent dining service and courteous attendants. Music and dancing on the Great Ship "SEEANDBEE".
Autoists, save a day C & B Line way. Avoid miles and miles of congested roadway.

Cleveland and Buffalo Division

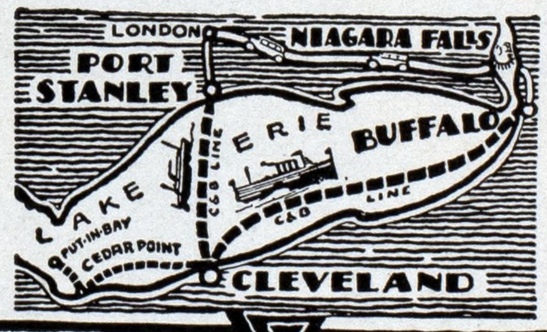
Each way, every night, leaving 9:00 p. m.; arriving 7:30 a.m. (E S T.) May 1st to Nov. 15th. New Low Fares, $4.50 one way. $8.50 round trip. Autos carried $6.50 and up.

Cleveland and Port Stanley, Ontario, Division

Daily service, leaving Cleveland, 12:00 midnight, arriving Port Stanley, 6.00 a m; leave Port Stanley, 4:00 p. m., arrive Cleveland 9:30 p. m. (E. S. T) June 29th to Sept. 8th. New Low Fares, $3.00 one way, $5.00 round trip. Autos carried $4.50 and up.

THE CLEVELAND AND BUFFALO TRANSIT COMPANY
Cleveland, Ohio :: Buffalo, N. Y. :: Times Bldg., New York City

Connections at Buffalo and Port Stanley for Canadian and Eastern points; at Cleveland, for points West and Southwest.



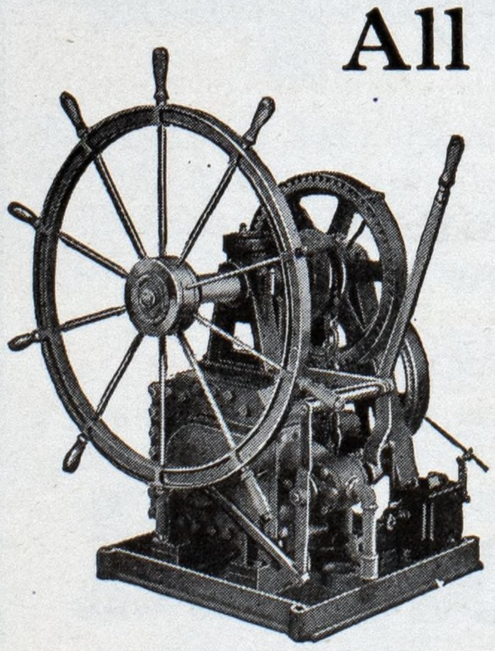
Ask for our No. 25 C & B Folder with Auto Map and details on trips.

Daily Excursions, Cleveland to Cedar Point and Put-in-Bay, June 9th to Sept. 2nd



"Save a Day - C&B Line Way"

All Over the Lakes They're Using Dake's

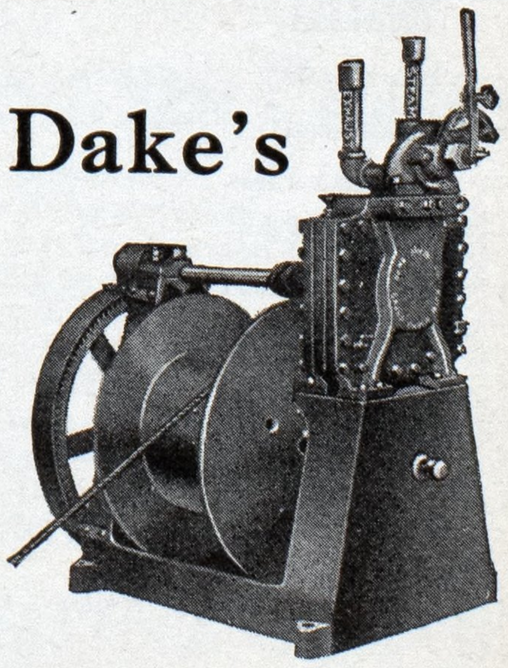


"CS" Steering Gear

Go into any port of consequence on the Great Lakes and you will find vessels using DAKE Steering Gears, Capstans, Windlasses or other auxiliaries. Ask the owners and you will find they give efficient dependable service, with the least expense for upkeep. DAKE Auxiliaries are all simple of construction and very compact. They require less space and very little attention. Write for information on any auxiliaries you are interested in.

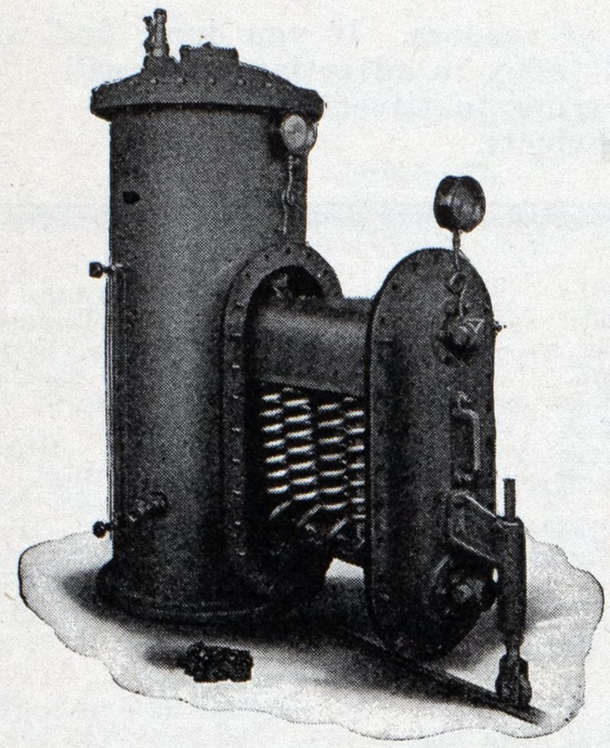
Steering Gears, Capstans (hand and steam) Anchor Windlasses, Stage Hoists, Snub Line Winches, Spud Lifters, Net Lifters and Marine Castings.

Dake Engine Co., GRAND HAVEN, MICHIGAN



Snub Line Winch

G-R Evaporators protect 10,000,000 B.hp.

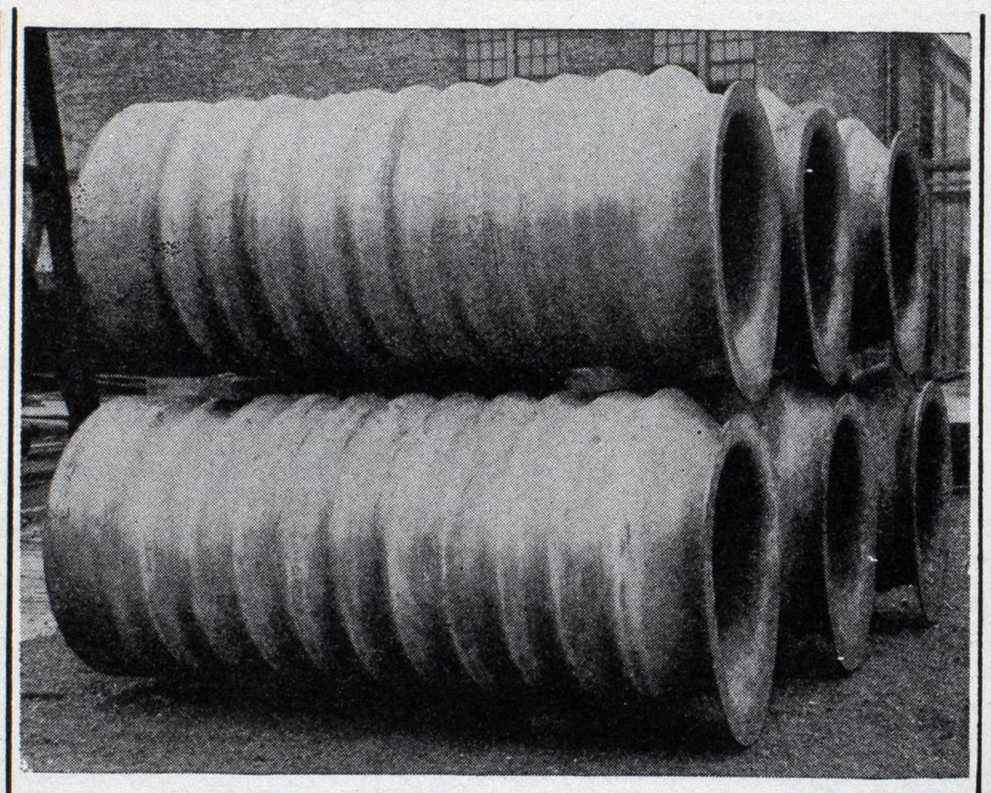


Assure pure boiler feed
Automatically scale-shedding
Increase boiler capacity

The Griscom-Russell Co.

285 Madison Avenue, New York
Chicago, Monadnock Bldg.

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Corrugated Marine Furnaces

A full range of sizes

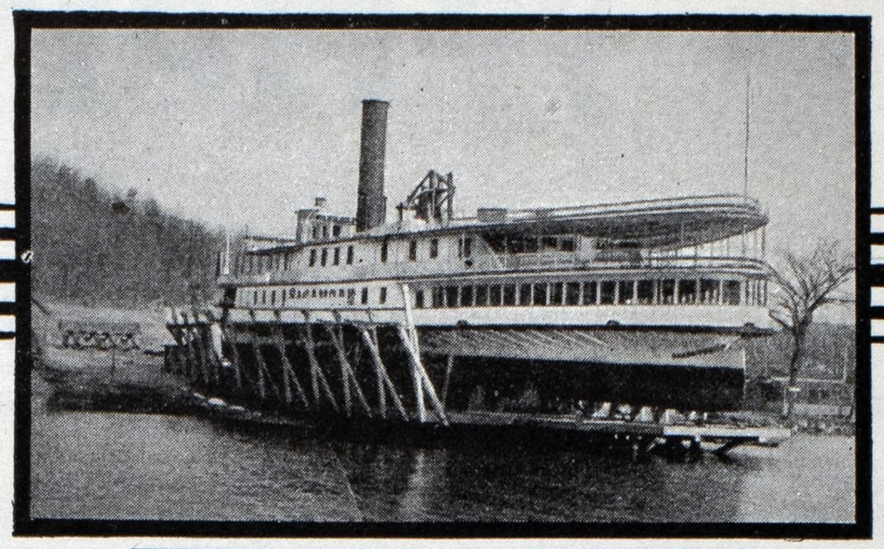
The largest plant capacity in America with more than a thousand tons of firebox furnace plates in stock enables us to meet your demands for quick delivery. Continuous production for many years gives assurance of superior quality.

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Box 485, Chicago, Ill.
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MR-6Gray

Lake George Steamboat Co.
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American Paulin System, Inc.,
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Willard Storage Battery Co.,
246 E. 131st St., Cleveland, O.

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Ritchie, E. S., & Sons,
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American Shipbuilding Co.,
Foot of W. 54th St., Cleveland, O.

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Diehl Manufacturing Co.,
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Sturtevant, B. F., Co.,
Hyde Park, Boston, Mass.

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Taylor Forge and Pipe Works,
1440 S. 49th St., Chicago, Ill.

BOILER PLATES (Zinc)
Hazel-Atlas Glass Co.,
16th and Market St.,
Wheeling, W. Va.

BOILERS (Marine)
Almy Water Tube Boiler Co.,
184 Allen St., Providence, R. I.
American Shipbuilding Co.,
Foot of W. 54th St., Cleveland, O.
Babcock & Wilcox Co.,
85 Liberty St., New York City.
Bethlehem Shipbuilding Corp., Ltd.,
Bethlehem, Pa.
Great Lakes Engineering Works,
River Rouge, Mich.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway,
New York City.
Oldman-Magee Boiler Works, Inc.,
36-40 Illinois St., Buffalo, N. Y.
Sun Shipbuilding & Dry Dock Co.,
Chester, Pa.
Toledo Shipbuilding Co.,
Toledo, O.

BOILERS (Water Tube)
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Babcock & Wilcox Co., The,
85 Liberty St., New York City.

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Penton Publishing Co., Cleveland, O.

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2840 Archer Ave., Chicago, Ill.

BOX STRAPS (Nails and Nailing)
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Farley, Edward P., & Co., Inc.,
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BURNERS (Oil)—See OIL BURNING EQUIPMENT

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Dake Engine Co.,
Grand Haven, Mich.
Hyde Windlass Co., Bath, Me.

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Hooven-Owens Rentschler Co.,
Hamilton, O.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway,
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Standard Motor Construction Co.,
172 Whiton St.,
Jersey City, N. J.

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Busch-Sulzer Bros.-Diesel Engine Co.,
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River Rouge, Mich.
Westinghouse Electric & Mfg. Co.,
So. Philadelphia, Pa.

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Benson Electric Co., Superior, Wis.

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Columbian Rope Co., Auburn, N. Y.
Samson Cordage Works,
Boston, Mass.
Whitlock Cordage Co.,
46 South St., New York City.

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Acme Steel Co.,
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Welin Davit & Boat Corp.,
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Long Island City, N. Y.

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DIESEL ENGINES—See ENGINES (Diesel)

DIESEL FUEL OIL—See FUEL OIL

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Griscom-Russell Co.,
285 Madison Ave., New York City.

DIVING APPARATUS
Morse, Andrew J., & Son, Inc.,
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American Shipbuilding Co.,
Foot of W. 54th St.,
Cleveland, O.
Great Lakes Engineering Works,
River Rouge, Mich.
Sturtevant, B. F., Co.,
Hyde Park, Boston, Mass.

DREDGING MACHINERY
Great Lakes Engineering Works,
River Rouge, Mich.
Westinghouse Electric & Mfg. Co.,
East Pittsburgh, Pa.

DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Bethlehem Shipbuilding Corp., Ltd.,
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Great Lakes Engineering Works,
River Rouge, Mich.
Manitowoc Ship Building Corp.,
Manitowoc, Wis.
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Newport News Shipbuilding & Dry Dock Co., 233 Broadway,
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New York Shipbuilding Co.,
Camden, N. J.
Sun Shipbuilding & Dry Dock Co.,
Chester, Pa.
Toledo Shipbuilding Co.,
Toledo, O.

DYNAMOS
Diehl Manufacturing Co.,
Elizabethport, N. J.
Westinghouse Electric & Mfg. Co.,
So. Philadelphia, Pa.

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Barrett-Cravens Co.,
1328 West Monroe St.,
Chicago, Ill.

EJECTORS (Ash)
Great Lakes Engineering Works,
River Rouge, Mich.
Westinghouse Electric & Mfg. Co.,
So. Philadelphia, Pa.

ENGINEERS (Marine, Mechanical and Consulting)
Crandall Engineering Co.,
134 Main St., Cambridge, Mass.
Great Lakes Engineering Works,
River Rouge, Mich.
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Busch-Sulzer Bros.-Diesel Engine Co.,
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Cooper-Bessemer Corp.,
Grove City, Pa.
Fairbanks, Morse & Co.,
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Standard Motor Construction Co.,
172 Whiton St.,
Jersey City, N. J.
Sun Shipbuilding & Dry Dock Co.,
Chester, Pa.

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Burmeister & Wain,
Maskin-og Skepsbuggeri,
Copenhagen, Denmark.
Busch-Sulzer Bros.-Diesel Engine Co.,
2nd and Utah Sts., St. Louis, Mo.
Cooper-Bessemer Corp.,
Grove City, Pa.
Fairbanks, Morse & Co.,
900 South Wabash Ave.,
Chicago, Ill.
Hooven-Owens Bentschler Co.,
Hamilton, O.
Standard Motor Construction Co.,
172 Whiton St.,
Jersey City, N. J.
Sun Shipbuilding & Dry Dock Co.,
Chester, Pa.

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Busch-Sulzer Bros.-Diesel Engine Co.,
2nd and Utah Sts., St. Louis, Mo.
Cooper-Bessemer Corp.,
Grove City, Pa.
Fairbanks, Morse & Co.,
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Chicago, Ill.
Standard Motor Construction Co.,
172 Whiton St.,
Jersey City, N. J.

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American Shipbuilding Co.,
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Cleveland, O.
Bethlehem Shipbuilding Corp.,
Bethlehem, Pa.
Busch-Sulzer Bros.-Diesel Engine Co.,
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Chicago Shipbuilding Co.,
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Cooper-Bessemer Corp.,
Grove City, Pa.
Fairbanks, Morse & Co.,
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Chicago, Ill.
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Hamilton, O.
Ingersoll-Rand Co.,
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New York Shipbuilding Co.,
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Sturtevant, B. F., Co., Inc.,
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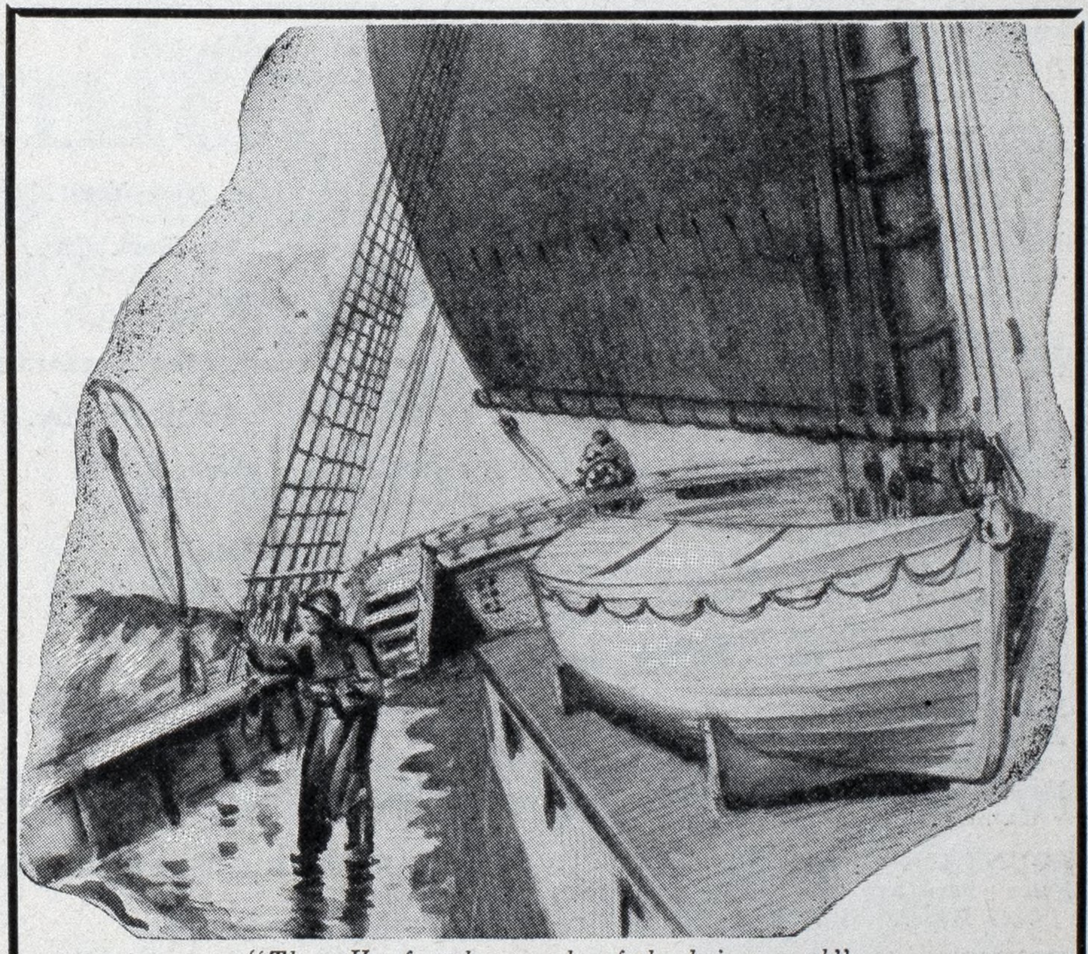
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Ingersoll-Rand Co., 11Broadway, New York City.
Standard Motor Construction Co., 172 Whiton St., Jersey City, N. J.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.

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Hooven-Owens Co., Hamilton, O.

ENGINES (Steam, Steering)
Dake Engine Co., Grand Haven, Mich.

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Hamburg-American Line 39 Broadway, New York City.

EVAPORATORS
Griscom-Russell Co., 285 Madison Ave., New York City.

FANS (Desk and Bracket-Oscillating and Non-Oscillating)
Diehl Manufacturing Co., Elizabethport, N. J.

FANS (Electric)
Diehl Manufacturing Co., Elizabethport, N. J.
General Electric Co., Schenectady, N. Y.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FANS (Ventilating)
Diehl Manufacturing Co., Elizabethport, N. J.

FEED WATER HEATERS—See HEATERS AND PURIFIERS (Feed Water)

FEED WATER REGULATORS
Babcock & Wilcox Co., 85 Liberty St., New York City.

FIRE EXTINGUISHER
American-LaFrance & Foamite Corp., Elmira, N. Y.

FIRE EXTINGUISHING SYSTEMS
American-LaFrance & Foamite Corp., Elmira, N. Y.

FIRE PROTECTION ENGINEERS
American-LaFrance & Foamite Corp., Elmira, N. Y.

FLANGES (Forged Steel Pipe)
Taylor Forge and Pipe Works, 1440 S. 49th St., Chicago, Ill.

FLOORING
Selby Battersby & Co., 810 Noble St., Philadelpiha, Pa.

FLOOR PLATES
Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

FORGINGS (Diesel Engine)
Titusville Forge Co., Titusville, Pa.

FOUNDERS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
New York Shipbuilding Co., Camden, N. J.

FOUNTAINS (Drinking)
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FREIGHT SERVICE
Hamburg-American Line, 39 Broadway, New York City.

FUEL OIL
Texas Co., The, 17 Battery Place, New York City
Vacuum Oil Co., 61 Broadway, New York City.

FURNACES (Corrugated Boiler)
Taylor Forge and Pipe Works, 1440 S. 49th St., Chicago, Ill.

FURNITURE
Marble & Shattuck Chair Co., 10200 Foster Ave., Cleveland, O.

GALLEY RANGES
Stamford Foundry Co., Stamford, Conn.

GAS (Acetylene Dissolved)
Prest-O-Lite Co., Inc., 30 East 42nd St., New York City.

GAS (Nitrogen and Oxygen)
Linde Air Products Co., 30 East 42nd St., New York City.

GAS (Welding and Cutting)
Prest-O-Lite Co., Inc., 30 East 42nd St., New York City.

GEARS (Marine Equipment)
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

GENERATING SETS
Diehl Manufacturing Co., Elizabethport, N. J.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

GENERATING SETS (Direct Connected)
General Electric Co., Schenectady, N. Y.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

GENERATORS
Diehl Manufacturing Co., Elizabethport, N. J.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Dixon, Jos., Crucible Co., Jersey City, N. J.

GRAPHITE GREASES
Dixon, Jos., Crucible Co., Jersey City, N. J.

GRAPHITE PAINT
Dixon, Jos., Crucible Co., Jersey City, N. J.

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Dixon, Jos., Crucible Co., Jersey City, N. J.

GREASE
Texas Co., The, 17 Battery Place, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

GREASE (Launching)
Texas Co., The, 17 Battery Place, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

HARDWARE (Marine)—See MARINE HARDWARE

HATCH FASTENERS
Mullholland Hatch-Fastener Co., Marion Bldg., Cleveland, O.

HAWSERS (Manila)
Columbian Rope Co., Auburn, N. Y.
Samson Cordage Works, Boston, Mass.
Whitlock Cordage Co., 46 South St., New York City.

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Davis Engineering Co., 90 West St., New York City.
Griscom-Russell Co., 285 Madison Ave., New York City.
Westinghouse Electric & Mfg. Co., So. Philadelphia, Pa.

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Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

HEATING STOVES
Stamford Foundry Co., Stamford, Conn.

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Hyde Windlass Co., Bath, Me.

HOISTS (Air)
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.

HOOPS AND BANDS
Acme Steel Co., 2840 Archer Ave., Chicago, Ill.

HULLS (Steel)
Ellis Channel System, Inc., 33 Rector St., New York City.

ICE MACHINES—See REFRIGERATING MACHINERY

INSURANCE (Marine)
Boland & Cornelius, Marine Trust Bldg., Buffalo, N. Y.

INTERNAL COMBUSTION ENGINES
Burmeister & Wain, Maskin-og Skepsbuggeri, Cupenhagen, Denmark.

LAMPS (Mazda and Arc)
General Electric Co., Schenectady, N. Y.

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Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn, N. Y.
Welin Davit & Boat Corp., 3-5 Vernon Ave., Long Island City, N. Y.

LIFESAVING EQUIPMENT
Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn, N. Y.

LIGHTING EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

LOGS (Patent)
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LUBRICATING OIL
Texas Co., The, 17 Battery Place, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

MACHINERY (Marine)
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Chicago Shipbuilding Co., So. Chicago, Ill.
Cooper-Bessemer Corp., Grove City, Pa.
Great Lakes Engineering Works, River Rouge, Mich.
Hooven-Owens Co., Hamilton, O.
Manitowoc Ship Building Corp., Manitowoc, Wis.
Maryland Dry Dock Co., Baltimore Md.
Toledo Shipbuilding Co., Toledo, O.

MACHINISTS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Busch-Sulzer Bros.-Diesel Engine Co., 2nd & Utah Sts., St. Louis, Mo.
Hooven-Owens Co., Hamilton, O.
New York Shipbuilding Co., Camden, N. J.

MANILA OAKUM—See OAKUM (Marine, Rope, Packings, Plumbers)

MARINE DECKING—See DECKING

MARINE ENGINES
Burmester & Wain, Maskin-og Skepsbuggeri, Copenhagen, Denmark.

MARINE RAILWAY BUILDERS
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Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Diehl Manufacturing Co., Elizabethport, N. J.
Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOTORS (Winch)
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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White, Kelvin & Wilfrid O., Co., 112 State St., Boston, Mass.

NITROGEN (Gas)
Linde Air Products Co., 30 East 42nd St., New York City

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Stratford, George, Oakum Co., 165 Cornelison Ave., Jersey City, N. J.

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Babcock & Wilcox Co., 85 Liberty St., New York City.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

OIL FOR ALL PURPOSES (Marine)
Texas Co., The, 17 Battery Place, New York City.
Vacuum Oil Co., 61 Broadway, New York City.

OXYGEN (Gas)
Linde Air Products Co., 30 East 42nd St., New York City.

PACKING RINGS
American Hammered Piston Ring Co., Baltimore, Md.

PASSENGER SERVICE
Hamburg-American Line, 39 Broadway, New York City.

PIPE (Iron and Steel)
Taylor Forge and Pipe Works, 1440 S. 49th St., Chicago, Ill.

PISTON RING MANUFACTURERS
American Hammered Piston Ring Co., Baltimore, Md.

PLATES (Rolled Zinc)
Hazel-Atlas Glass Co., 16th & Market St., Wheeling, W. Va.

PLATFORMS (Lift Trucks)
Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill.

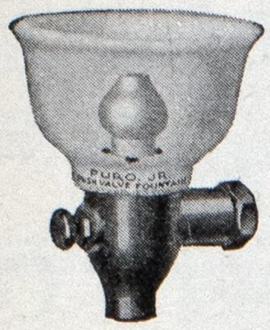
PORT FACILITIES
Newark, Port of City Hall, Newark, N. J.
American Paulin System, Inc., 1220 Maple Ave., Los Angeles, Calif.

PROPELLER BLADES AND HUBS
Sheriffs Mfg. Co., Milwaukee, Wis.

PROPELLER WHEELS
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Detroit Ship Building Co., Detroit, Mich.
Great Lakes Engineering Works, River Rouge, Mich.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
Sheriffs Mfg. Co., Milwaukee, Wis.
Toledo Shipbuilding Co., Toledo, O.
Trout, H. G. Co., 220 Ohio St., Buffalo, N. Y.

PROPELLERS
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Hyde Windlass Co., Bath, Me.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above



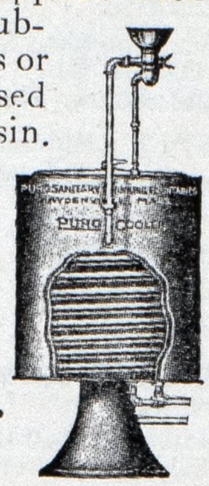
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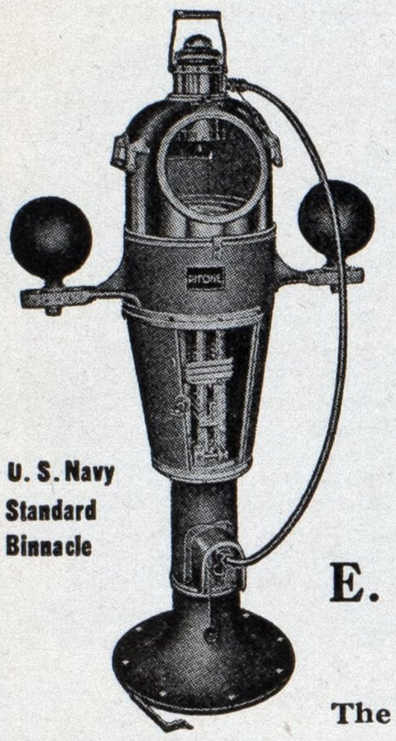


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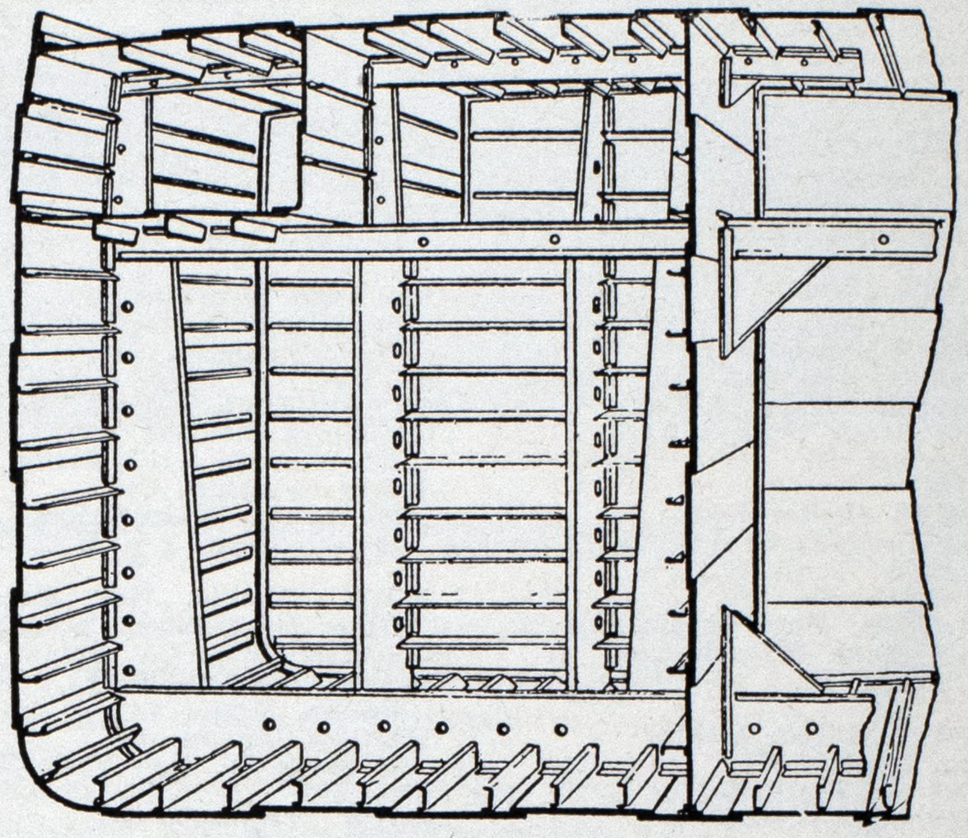
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Eliminates Bulkhead Brackets
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PUMPS (Power)
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PUMPS (Steam)
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RACKS (Storage)
Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill.

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Radiomarine Corp. of America, 66 Broad St., New York City.

RADIO EQUIPMENT
Radiomarine Corp. of America, 66 Broad St., New York City.

RAFTS
Lane, C. M., Lifeboat Co., Inc., 856 Humboldt St., Brooklyn, N. Y.

RAILWAY DRY DOCKS
Crandall Engineering Co., 134 Main St., Cambridge, Mass.

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Stamford Foundry Co., Stamford, Conn.

REPAIRS
Maryland Dry Dock Co., Baltimore, Md.

REPAIRS (Electric)
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

REPAIRS (Marine)
American Shipbuilding Co., Foot of W. 54th St., Cleveland, O.
Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Chicago Shipbuilding Co., So. Chicago, Ill.
Federal Shipbuilding & Dry Dock Co., Lincoln Highway, Kearney, N. J.
Great Lakes Engineering Works, River Rouge, Mich.
Manitowoc Ship Building Corp., Manitowoc, Wis.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
New York Shipbuilding Co., Camden, N. J.
Sun Shipbuilding & Dry Dock Co., Chester, Pa.
Toledo Shipbuilding Co., Toledo, O.
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Hooven-Owens Co., Hamilton, O.

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Manitowoc Ship Building Corp., Manitowoc, Wis.
Maryland Dry Dock Co., Baltimore, Md.
Newport News Shipbuilding & Dry Dock Co., 233 Broadway, New York City.
New York Shipbuilding Co., Camden, N. J.
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Hyde Windlass Co., Bath, Me.

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Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Hyde Windlass Co., Bath, Me.

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Acme Steel Co., 2840 Archer Ave., Chicago, Ill.

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Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill.
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Clark Tructractor Co., Battle Creek, Mich.
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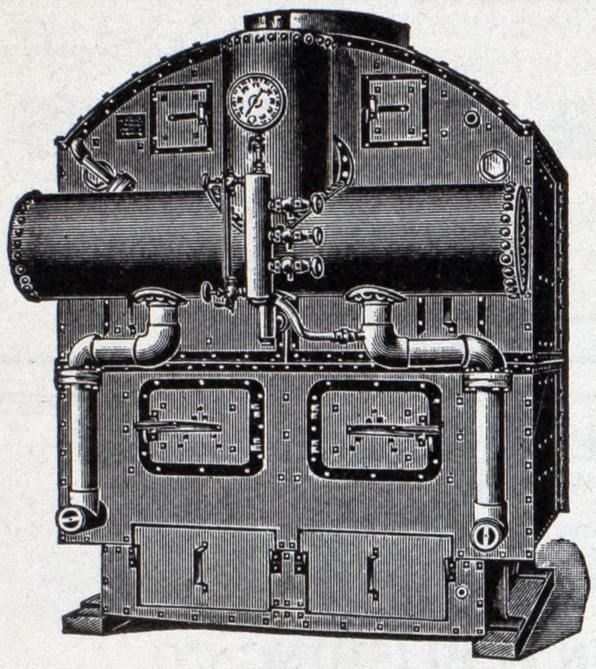
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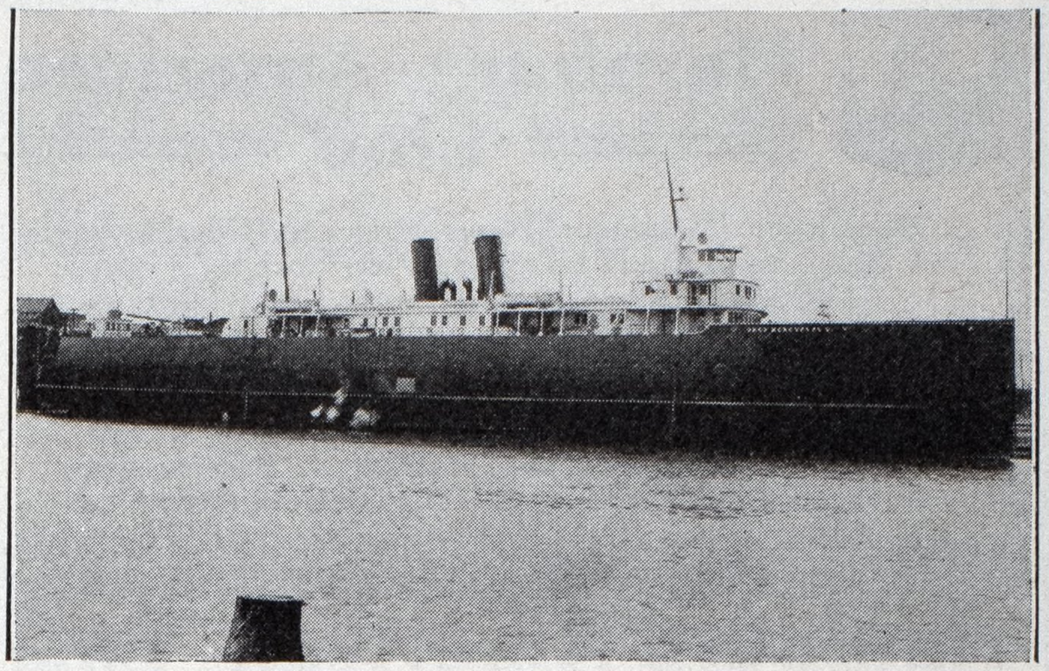


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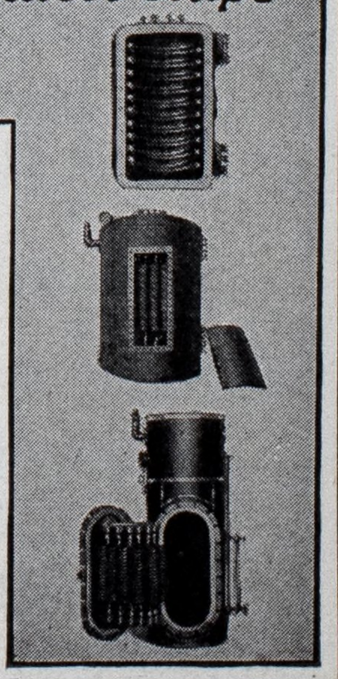
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AMERICAN GULF ORIENT LINE
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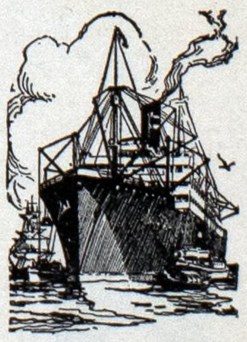
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We have the greatest industries in the world, the greatest trade, and the greatest need *for shipping facilities. Our Merchant Marine* should *be the greatest. And it will be . . . when American Business gives first choice to American ships!*



UNITED STATES SHIPPING BOARD MERCHANT FLEET CORPORATION

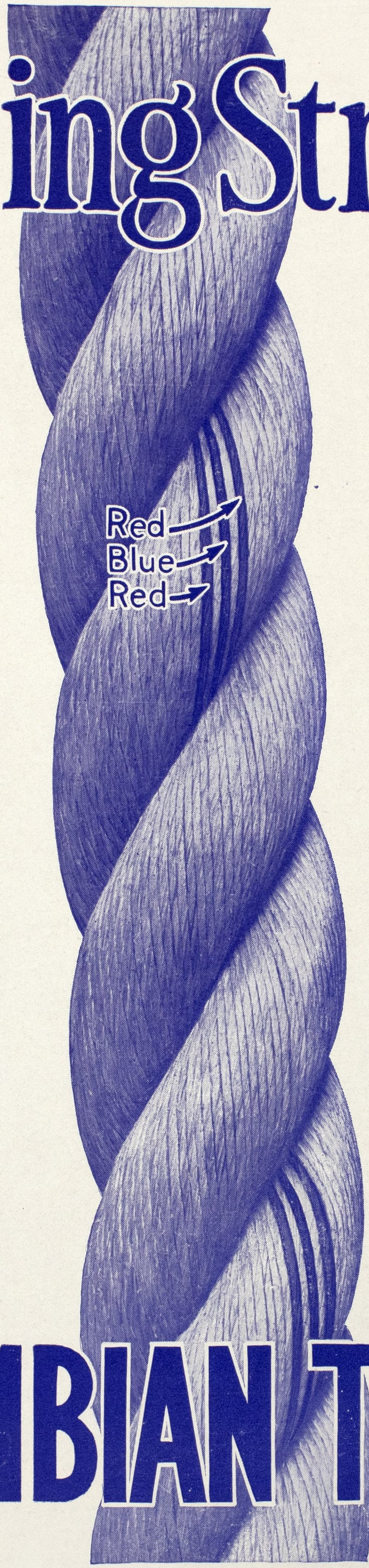
WASHINGTON, D. C.

Amazing Strength

Those who use me are astonished at my super-a-bundant strength, at the excess strength which I hold in reserve.

And yet, it is only natural that I should possess even greater strength than any other towing line when you consider how I am made.

My great strength lies in my heart and is made possible by the large, slightly spun yarns of which my heart is composed. When fibre is spun, a frictional contact is set up between the fibres which not only gives the line added strength but also assures that it will retain its form. That is one of the real secrets of my strength. Another is the proper selection of fibre by our own fibre buyers in the Philippine Islands.



In order to securely protect my heart and resist outside abrasive wear, a jacket composed of regular sized yarns of double thickness is used. This strong, tough outside jacket contains the red, white, blue, white and red markers, by which I can be identified at a glance as Columbian Tow-Ro Pure Manila Rope.

To make me still more desirable, I have flexibility without distortion, I am thoroughly waterproofed, I can be spliced easily and I am positively Guaranteed by the famous Columbian *Tape-Marker.*

For any additional information, write to my nearest branch office.

Columbian Rope Company
332-90 Genesee Street
Auburn, N. Y. *"The Cordage City"*
Branches:— New York Chicago Boston
New Orleans Philadelphia

COLUMBIAN TOW-RO

Patent Applied For

U. S. S. Pensacola Takes to Water

The newest addition to the U. S. Navy . . . the cruiser Pensacola . . . has been successfully launched and is now ready for her equipment. This will include both operating and fighting apparatus of the latest and most dependable type.

Dependability of performance is most essential in a fighting ship. To meet the rigid requirements demanded for this type of ship

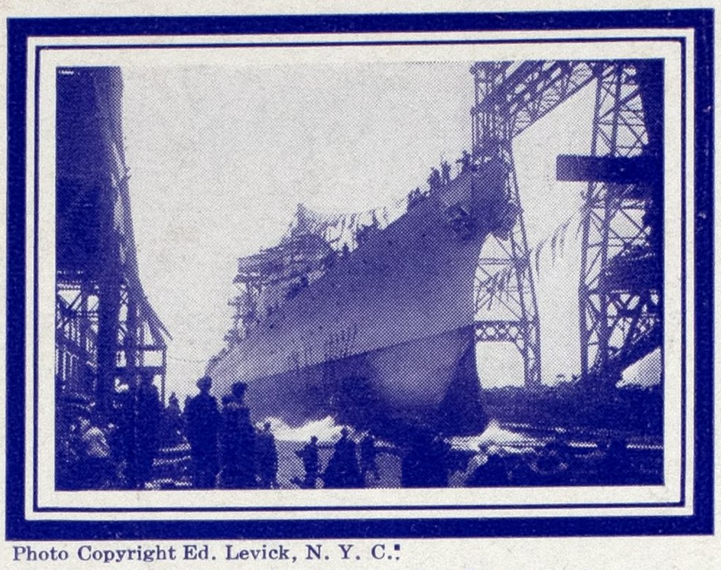


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Launching of U. S. S. Pensacola at Brooklyn Navy Yard, April 25, 1929

Sturtevant equipment will be installed for heating, ventilating and forced draft and many engine room auxiliary uses . . . in all a total of 74 units.

The many outstanding features and proved performance records of Sturtevant apparatus have been recognized throughout the Marine field as evidenced by the prominent list of installations on all types of ships. Our Marine department will gladly recommend equipment that will meet your specific requirements.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Sales Engineering Offices in Principal Cities

Sturtevant (REG·U·S·PAT·OFF·) *Marine Equipment*

Heating and Ventilating Equipment— Mechanical Draft Equipment—Turbines—Motors—Blowers— Ventilating Sets—Heaters—Generating Sets—Exhausters Gasoline and Steam Engines

If You Want The Best Specify

Hyde

S. S. "H. F. HARVEY" owned by Pittsburgh Steamship Co. and built by Great Lakes Engineering Works.

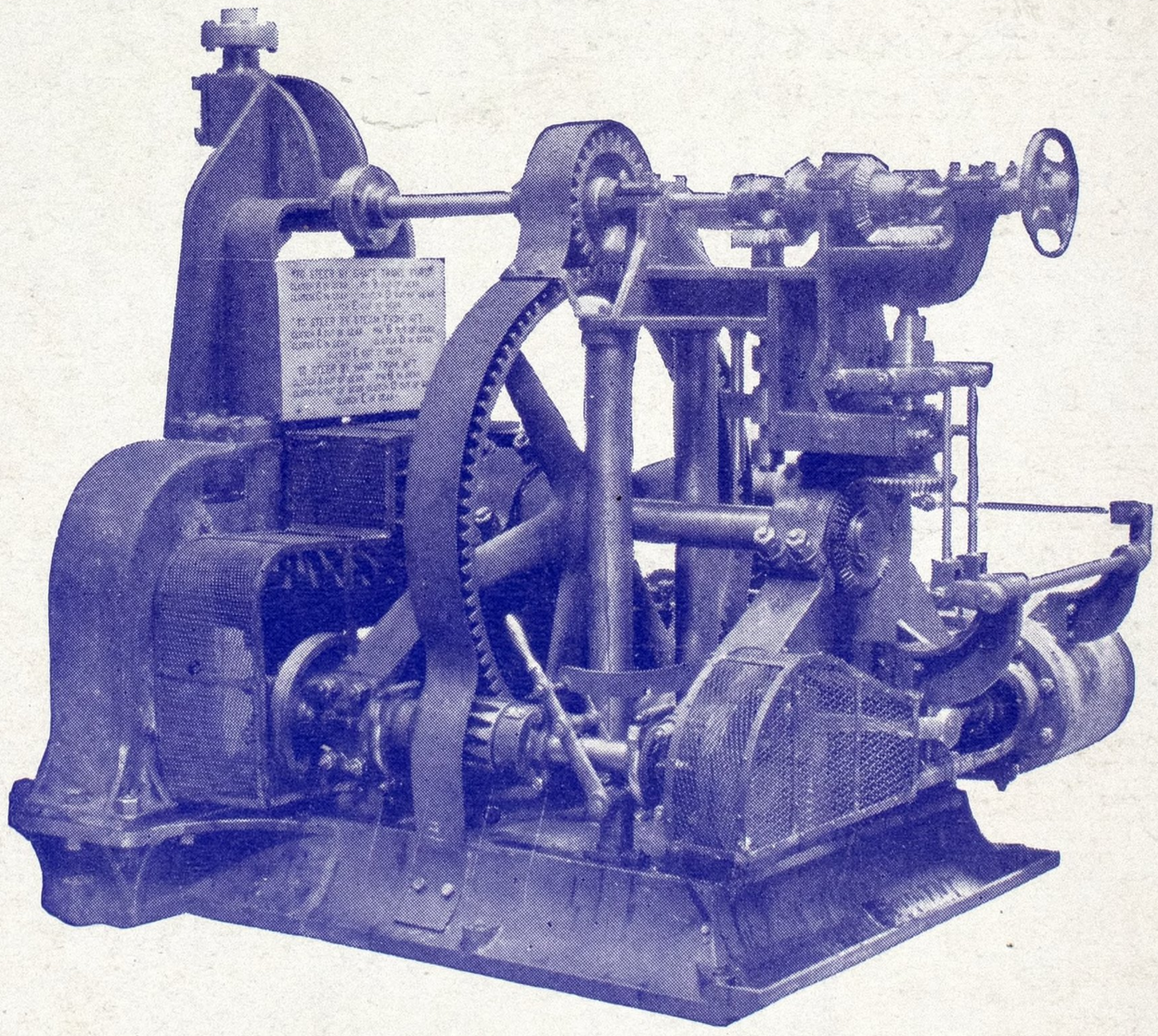
S. S. "B. F. AFFLECK" owned by Pittsburgh Steamship Co. and built by Toledo Shipbuilding Co.

S. S. "S. T. Crapo" owned by Huron Transportation Co. and built by Great Lakes Engineering Works.

These three fine new boats are all equipped with

Hyde

Quadrant Type Steering Gear
Spur Gear Windlass
Mooring Winches
Hatch Winches



HYDE Quadrant Type Steering Gear

Hyde Windlass Company

Bath, Maine

Marine Review

Reg U.S. Pat. Off.

The National Publication Covering the Business of Transportation by Water

June, 1929

Welded Piping Aboard Ship

Reduces Dead Weight and Conserves Space



The Best of Everything for

OXWELDING AND CUTTING

LINDE OXYGEN
The Linde Air Products Company

Prest-O-Lite
Dissolved Acetylene
The Prest-O-Lite Company, Inc.

Oxweld
Apparatus and Supplies
Oxweld Acetylene Company

UNION CARBIDE
Union Carbide Sales Company

Units of

UNION CARBIDE AND CARBON CORPORATION

General offices
30 East 42nd Street
New York, N. Y.

UCC

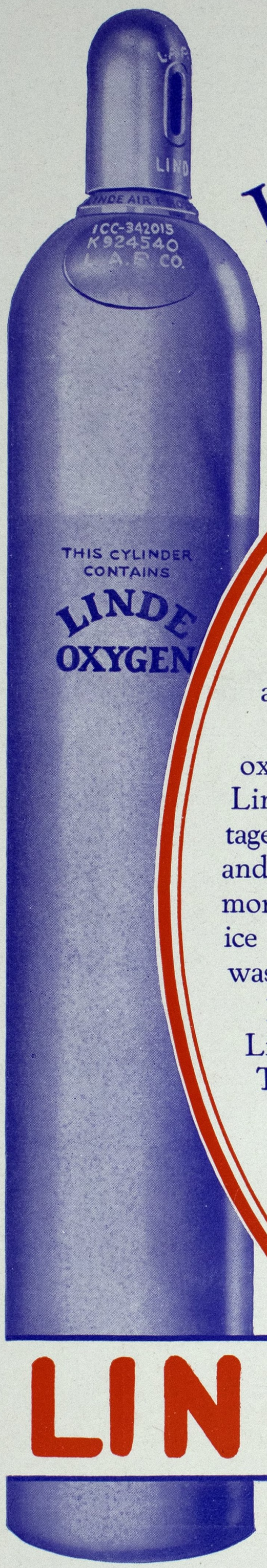
Sales offices in
Principal cities
throughout the country

64 Linde plants—45 Prest-O-Lite plants—154 Oxygen Warehouse stocks—138 Acetylene Warehouse stocks—38 Apparatus Warehouse stocks—235 Carbide Warehouse stocks

"THE welded joint is ideal for piping systems of any kind. . . This type of joint is more compact, requires no flanges, lasts longer. . . It is absolutely leakproof. . . The welded joint gives a permanent, ship-shape appearance, afforded in no other way."

—From January, 1929, issue of *"Marine Review"*





Lower Production Costs through Linde

"One-fifth

off our entire production cost of steel barrels is the result to us of Linde Process Service," says a prominent manufacturer, "an annual saving running well into five figures."

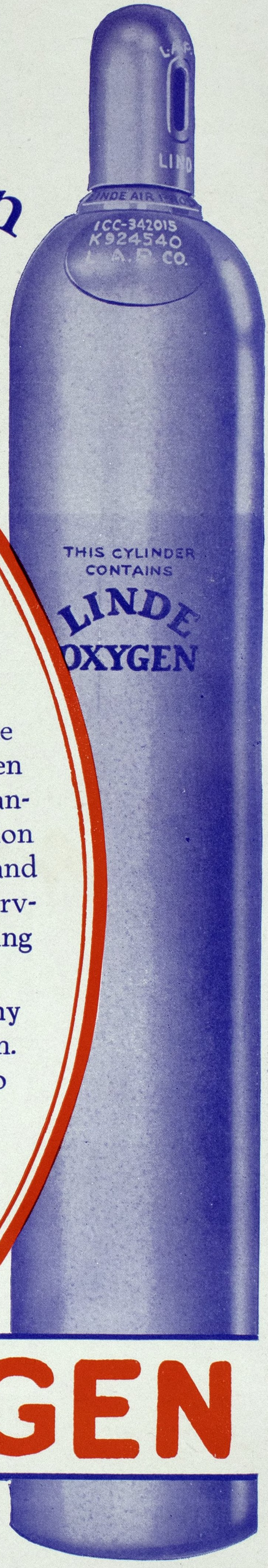
This manufacturer was effectively using the oxy-acetylene process of welding and cutting when Linde was called in. He was already taking advantage of all its apparent economies in both production and maintenance. Still, through the broader and more comprehensive experience of the Linde Service organization. this important additional saving was effected.

Linde Process Service is but one reason why Linde Oxygen has the greatest sale of any oxygen. This Service is available without cost to Linde users.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation

64 Plants UCC 154 Warehouse Stocks

General Offices: Carbide and Carbon Building
30 East 42nd Street, New York



LINDE OXYGEN

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